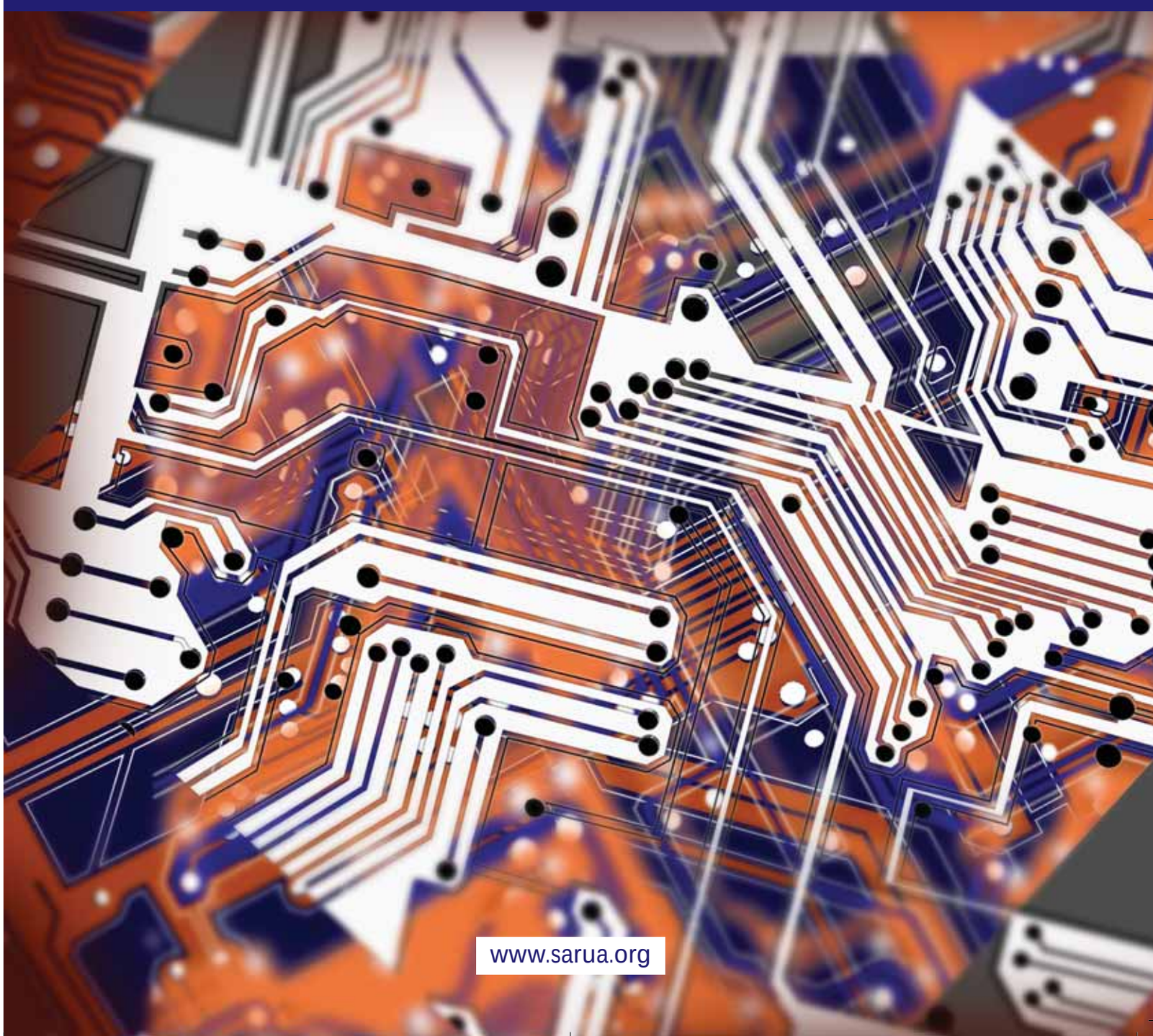
sarua
southern african regional universities association

Study Series 2008

Opening Access to Knowledge

in Southern African Universities

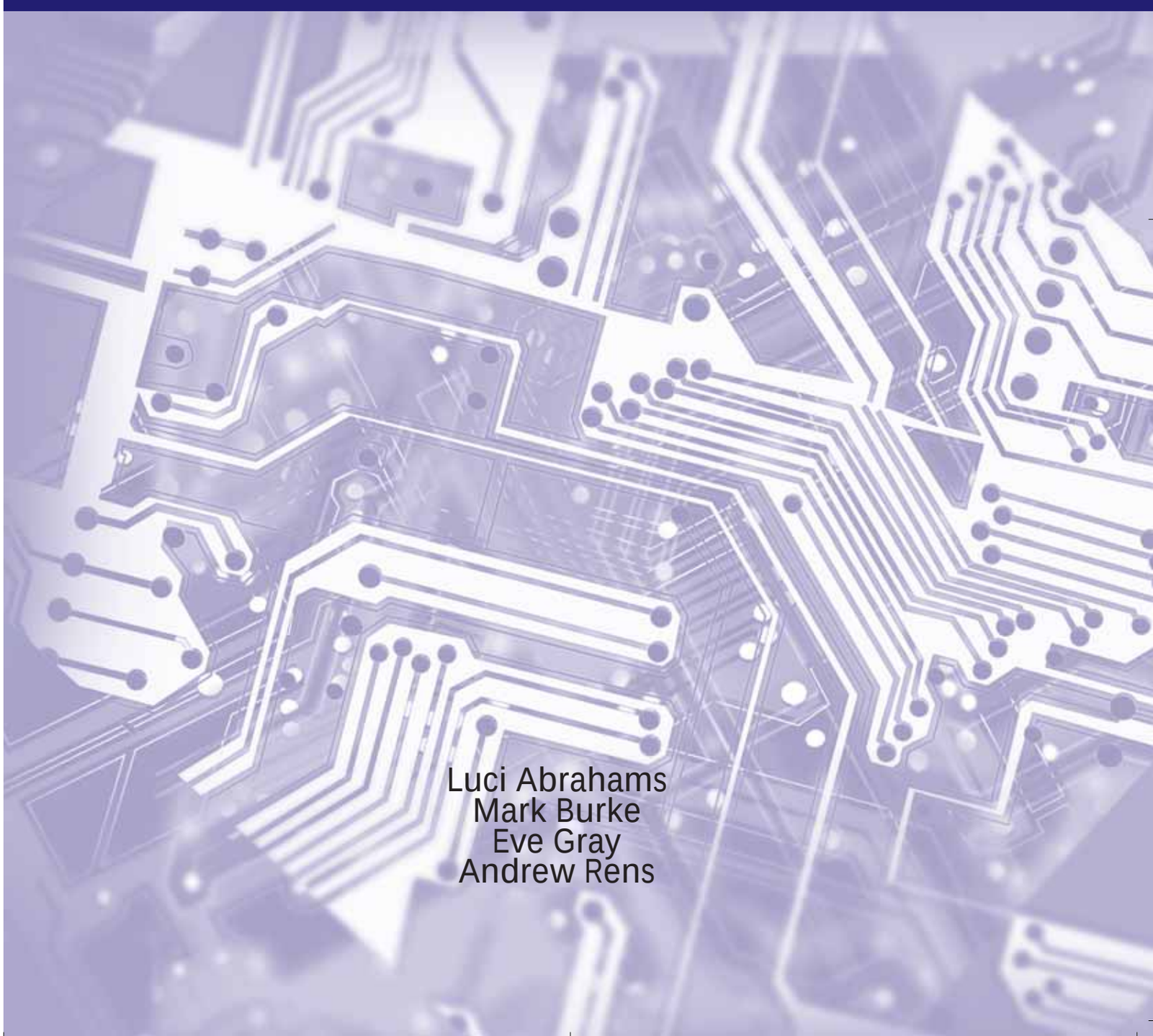


sarua
southern african regional universities association

Study Series 2008

Opening Access to Knowledge

in Southern African Universities



Luci Abrahams
Mark Burke
Eve Gray
Andrew Rens

Published by SARUA 2008
P.O Box 662
WITS
2050
SOUTH AFRICA

ISBN 978-0-9814099-8-6

SARUA is a not-for-profit leadership association of the heads of the public universities in the 15 countries of the SADC region. Its mission is to promote, strengthen and increase higher education, research and innovation through expanded inter-institutional collaboration and capacity-building initiatives throughout the region. It promotes universities as major contributors towards building knowledge economies, national and regional socio-economic and cultural development, and for the eradication of poverty.

The authors are responsible for the choice and the presentation of the facts and data contained in this document and for the opinions expressed therein, which are not necessarily those of SARUA and do not make any commitment for the Association.

STUDY AUTHORS:	Luci Abrahams, Mark Burke, Eve Gray & Andrew Rens
PRODUCTION:	Gail Robbins, DGR Writing & Research cc
PROOF READER:	Rachael Sadler
DESIGN:	Franz du Plessis ADVERTISING and DESIGN
LAYOUT:	Sarita Rheeder-Rosa, JAM STREET Design (Pretoria)
PRINTING:	Colorpress (pty) Ltd

TABLE OF CONTENTS

DIAGRAMS

FIGURES

TABLES

AUTHORS

Luci Abrahams
Director, LINK Centre, University of the Witwatersrand, Mwalimu House, Wits Parktown Campus

Mark Burke
Associate, LINK Centre, University of the Witwatersrand, Mwalimu House, Wits Parktown Campus

Eve Gray
Honorary Research Associate, Centre for Educational Technology, University of Cape Town, Rondebosch, Cape Town

Andrew Rens
Fellow, Shuttleworth Foundation, Durbanville, Cape Town

ACKNOWLEDGEMENTS

A special thank you is due to all the respondents for making the time available to participate in the study and sharing their experiences with the project researchers. The researchers from each of the seven countries deserve a special thank you for the expert manner in which they conducted and recorded the interviews. They are:

- Boemo Jorosi, Botswana
- Diana Mawindo, Malawi
- Shalini Ramessur, Mauritius
- Zeferino Saugene, Mozambique
- Rachel Browne, South Africa
- Edda Tandi Lwoga, Tanzania
- Christine Wamunyima Kanyengo, Zambia

Finally, the administrative support provided by Tamsyn Chetty and Coco Belgarrab from SARUA contributed significantly to the effective execution of the project.

ABBREVIATIONS

ASSAf	Academy of Science of South Africa
DVC	Deputy Vice-Chancellor
ETD's	Electronic Theses and Dissertations
HEIs	Higher Education Institutions
ICTs	Information and Communication Technologies
IDRC	International Development Research Centre
ISI	Institute for Scientific Information
NASAC	Network of African Science Academies
NRENs	National Research and Education Networks
NRF	National Research Foundation
OA	Open Access
SARUA	Southern African Regional Universities Association
SADC	Southern African Development Community
SciELO	Scientific Electronic Library Online

FOREWORD

The tipping point for African research and innovation will not be merely the ability to fully access and use the new abundance of global knowledge and ideas but to make an active and significant contribution to its creation.

This study has identified key constraints in access to knowledge in universities in the SADC Region and builds on the findings from two earlier studies of *SARUA, A Status Review of ICT in Universities in the SADC Region (2006)*, and *Science and Technology: A Baseline Study on Science and Technology and Higher Education in the SADC Region (2007)*.

Not only do the authors show that the presence of research from Africa in leading international peer-reviewed journals is diminishing, but just as importantly it also highlights the obstacles that prevent the majority of Africa research from ever receiving an adequate profile or readership within African research communities, let alone internationally.

Many of the restrictions on access to knowledge in Africa, but particularly in the Southern Africa Region, revolve around restrictive copyright practices and regulations, a lack of access to Internet-based technologies, out-dated paradigms for knowledge collection and dissemination, and the lack of creative and effective government supported enabling environments within higher education to match the vision of African leaders for knowledge and innovation in Africa in the 21st century.

The report offers a series of recommendations to address these challenges, both at a policy level and with regard to research and dissemination (e.g. an 'open knowledge platform' for the region). These are of sufficient magnitude that a paradigm shift is required in thinking, knowledge generation and dissemination. Sufficient critical and concerted action will be necessary in order to produce a series of 'break throughs'.

Whilst SARUA agrees with the challenges that the report highlights, and is committed to supporting the vision of open access to knowledge that is outlined in the report, the recommendations in the report will be subject to an accompanying consultative leadership process amongst its members that will hopefully charter a detailed and practical course of action for the Association.

SARUA also hopes that this study will stimulate not only debate and new ideas, but also practical action among all stakeholders in both the policy realm and in the higher education research environment. In addition to its proposals, the study provides an insightful and balanced explanation of some of the key concepts and terminology surrounding open knowledge, copyright and 'open access'. We hope this report will provide both a useful guide and a starting point for our member universities across SADC, to inform policy discussions nationally and regionally, and for the construction of a 'knowledge society' open to all the region's citizens.

We would welcome your comments and ideas on the substance of the report and the challenges of access to knowledge in our region.

Piyushi Kotecha
Chief Executive Officer
SARUA

EXECUTIVE SUMMARY

The emergence of a global knowledge-based society in which the production and dissemination of knowledge is viewed as critical for meeting the social and economic needs of nations is foregrounding the role of universities as knowledge producers. Universities in Southern Africa are under increasing pressure to increase their research and knowledge output in view of contributing to national developmental goals. Scholarly communication plays a strategic role in disseminating knowledge produced in universities. Scholarly publishing includes publication in ISI-journals, in local journals, in books, in theses and dissertations and in so-called 'grey literature'. However, the levels of research production in the Southern African region are generally low and falling behind other regions in the world, while the means of dissemination are highly restricted. The result is that academics, students and practitioners in fields to which the research is pertinent, have limited access to the knowledge produced here. The Internet and other collaborative technologies have the potential to make a significant contribution to dissemination, and hence to the benefits that flow from the greater availability of knowledge. These benefits include enabling successive generations of scholars to build on each other's work and disseminating knowledge through high quality degree programmes to the broader world.

Restrictions on access to knowledge include, inter alia, the traditional copyright modes of publication and lack of access to the Internet. Alternatives to traditional copyright for scholarly publications include approaches referred to as 'open knowledge' and 'open access'. These approaches enable scholars to select the most appropriate mechanisms for publishing their research, through selection amongst a wider array of licences than the copyright licence and bring Creative Commons licences into the field of play.

This framework and study, entitled *Opening Access to Knowledge in Southern African Universities*, aims to identify key constraints to access to knowledge in universities in the SADC region. The report should be read together with two other studies conducted for SARUA in 2007: *A Status Review of ICT in Universities in the SADC Region* and *Science and Technology: A Baseline study on Science and Technology and Higher Education in the SADC Region*, as the latter studies shed light on the context in which the recommendations for 'opening access' are made.

Eight universities in seven countries were selected to participate in the qualitative study. A major constraint to accessing research undertaken in the region is the lack of awareness of what has been produced. Research produced in the region tends to be poorly organised, not indexed and not made available electronically. The predominance of unpublished research and scientific output, often dismissively referred to as 'grey literature' does not lend itself to electronic discovery processes and, as a consequence, is not accessible. Respondents indicated that the behaviour of researchers, who do not share their research output, contributes to this state of affairs. The lack of capacity to make research available online further exacerbates the situation. The publishing criteria used to determine promotion and reward further serve to steer the publishing patterns of researchers into disseminating research results in international accredited journals which are often not available to universities in the region. Researchers prefer to publish in international journals rather than journals produced in the region due to perceptions of poor quality. Trust and confidence in local journals are further adversely affected because many journals are perceived to be published irregularly or fail to remain in existence.

A significant proportion of respondents are aware of open access approaches to disseminating knowledge. All the DVC's for research and librarians interviewed are aware of open access, indicating that there is an increasing awareness of open access at the institutional level. Eighty percent of researchers and more than half the Deans interviewed are aware of open access. However, respondents from university presses were less familiar with this emerging trend. The majority of interviewees were in support of open access, of which a large proportion (77 percent) indicated that they explicitly support the introduction of open access.

Notwithstanding the support for the introduction of open access to promote access to knowledge, respondents did raise a number of concerns pertaining to the quality of open access material that is not peer-reviewed; copyright, plagiarism and recognition for research output. Respondents expressed concern about the quality of open access material, particularly when it is not peer-reviewed. Respondents are plagued by uncertainties pertaining to intellectual property rights in the electronic environment. It emerged that respondents are not clear about where ownership vests in the context of institutional repositories in particular. A fear of plagiarism was identified as having a further negative influence on the attitude of respondents to open access. Moreover, uncertainty over whether open access published research will be afforded the same recognition in university promotion policies serves to hinder the uptake of open access. Given all these constraints it was difficult for some academics to conceive of how open access would be operationalised in their respective university environments.

Experiments with open access are already underway in universities, with initiatives such as the development of an electronic catalogue of university scholarly materials at the Eduardo Mondlane University, Mozambique that could act as foundation for developing an institutional repository; the establishment of a repository of electronic theses and dissertations (ETDs) up and running at the University of Pretoria, South Africa and in the preparatory phase at the University of Dar-es-Salaam, Tanzania; the implementation of an institutional repository for all scholarly output including images from cultural collections and the production of an electronic journal, also at the University of Pretoria. These initiatives face considerable challenges to successful introduction into the mainstream of university life and practice and provide interesting pointers to the issues that need to be addressed for the successful implementation of open access projects and an open knowledge paradigm. A favourable university policy environment, as well as effectively funded institutional and technical capacity, is needed in order to promote sustainable implementation of initiatives to enhance scholarly publishing and dissemination in the region.

The report proposes a new framework that is based on open knowledge approaches to knowledge production, publishing and dissemination in response to the identified constraints and challenges to a productive academic research and publishing sector. The adoption of a proposed Vision for Open Knowledge in Southern African Universities and the establishment of a research publishing and dissemination platform are an integral part of such a framework.

PART I

This part of the report offers a framework for creating the requisite university policy landscape in An Open Knowledge Vision for Southern African Universities, supported by a 'flight plan' of commitments that would need to be undertaken by university leadership. Then follows recommendations to address the institutional and technical capacity requirements, namely a Southern African research publishing and dissemination platform.

1. Introduction

The Southern African Regional Universities Association (SARUA) has embarked on a series of initiatives to increase the understanding of the current realities and the challenges for universities in the region. These challenges relate to the future of research, teaching and community engagement. Early research studies include the 2007 studies on Science, Engineering and Technology and ICT Infrastructure. This study provides an important contribution alongside the 2007 studies and addresses the question of scholarly publishing and dissemination. Scholarly publishing and dissemination is a necessary mechanism to foster the growth of science and technology research in Southern Africa. Scholarly publishing and dissemination also provides local content for academic teaching and learning. In order to build on existing knowledge, the Internet today offers new tools for easy dissemination. However, this is dependent on the availability and cost of ICT infrastructure, as discussed in the 2007 study. Hence, the three studies should be read together in charting future directions.

A major gap in regional universities in the onset of the 21st century is the gap in the availability and accessibility of knowledge. In short there is a scarcity in knowledge. In its many forms including research, scholarly publishing and dissemination. This scarcity applies both to knowledge produced outside the region and knowledge produced locally. The SARUA theme on ICT Preparedness, Institutional Management and Infrastructure Development recognises that the 'freedom and flow of content' is essential for breaking the backlogs in knowledge availability and production. In other words, new knowledge is built on pre-existing knowledge and for that continuous knowledge generation to occur, existing knowledge must be freely available and must flow from where it is produced to where it is needed.

The SARUA Open Access Leadership Summit in Botswana in November 2007 addressed itself for the first time to the question of open access, which has become a key topic on the agenda of university leadership internationally. This emerging trend is a response to the lack of accessibility of research publications in northern countries despite an abundance of knowledge. This is largely as the result of the growth of a proprietary and globally consolidated scholarly publishing industry that has driven substantial price increases over the last decade as well as by restrictive practices in online content licensing. Southern African countries have a dual challenge – increasing the accessibility of available knowledge and increasing the volumes of research knowledge that are produced in the region. In this context, open knowledge approaches, specifically openness in scholarly publishing and dissemination, can have the effect of increasing abundance in knowledge.

2. Southern African Universities: Emerging paradigm and opportunities for Scholarly Publishing and Disseminating Knowledge[1]

Creating the 21st century African scholarly publishing environment – conceptualising scholarly research and publishing in the context of access to knowledge and the Internet.

In the first decade of the 21st century, Southern African universities have entered into an era of institutional change, in the context of countries in the region aiming for greater economic productivity and social change. This takes place against the backdrop of a broad African agenda for change. In the current environment of continental change, new knowledge is sought after in areas ranging from climate change to infrastructure investment, from ICT and development to HIV/AIDS and migration. Universities as agencies of knowledge exchange and production are a potential source of knowledge inputs to the economy and society. However, this value can only be realised if universities increase their rate of knowledge production over the next 20 years. A fundamental change in institutional capacities and output can generate the basis for the long-term development of the university missions of teaching, research and community engagement.

University research, in particular, has a key role to play in creating and disseminating knowledge, both as inputs to and as observations on economic and social change. Scholarly publishing in Mozambican universities could focus on the needs of rural infrastructure development, and generating the knowledge resources for key industries such as agriculture and tourism. Scholarly publishing across the region can focus on emerging or declining economic sectors such as mining in Zambia or manufacturing in South Africa. Research in all countries can focus on common issues of environmental management, poverty and migration, issues that touch all countries in the region. For this to happen, knowledge needs to be abundant. Hence, to achieve this ideal, university research needs to come out of the doldrums of limited publishing production and restricted access to scholarly publications, for Southern African knowledge to be widely, easily and affordably available. This research can be made available in academic journals and publications and on the Internet, under Creative Commons licenses to encourage sharing of knowledge for non-commercial purposes.

The existing mode of research and scholarly publication, based on highly restrictive copyright regimes in countries, universities and a scholarly value system that rewards publication in the global North, is an impediment to building a knowledge engine for the Southern African economy. The current frame of new knowledge and peer production, with requirements to publish in a hierarchy of academic journals, placing ISI journals at the top of the hierarchy, local journals at the bottom of the hierarchy, and excluding 'grey literature' from acknowledgement in institutional promotion and reward systems, may have contributed to the extremely low rates of production. In reality, universities experience the absence of a research value chain which could encourage high levels of research output at all levels of the hierarchy. Only scholars who publish at the top end are valued, thus 'driving out the good in favour of the great'. The challenges in Opening Access to Knowledge include producing a large body of scholars and scholarly work, in disciplines and on cross-disciplinary subjects that are within the realms of an African agenda for knowledge. Scholarly publishing sits at the heart of this.

The current paradigm of scholarly publishing in universities is one of scarcity of knowledge and incremental development in publishing infrastructure and output. However, a scenario of incremental change in the development and funding of the mechanisms and infrastructure for scholarly publishing are highly unlikely to result in any breakthroughs in the quantum or quality of academic publishing in the next decade, or indeed in the next two to three decades. A medium- (three-year) to long-term (five – 20 year) phased

1 This section is the authors' interpretation of the open knowledge paradigm in the Southern African context. A literature review is available at Section 6 of this report.

approach for galvanising the efforts in this area of academic activity are needed in order to establish a new paradigm of publishing productivity, research utilisation and open access to knowledge. Open knowledge approaches can enable the growth of a large body of scholars and of scholarly work as researchers build on each other's knowledge by sharing rather than restricting.

In placing the history of under-development firmly in the past, this new century holds the opportunity for a shift towards a productive academic research and publishing sector. A new frame is needed to motivate Southern African scholars to research, write and publish within a local agenda, on issues relevant to African countries and societies, and with highly effective dissemination of these ideas in the public domain. This requires a paradigm shift in knowledge production, publishing and dissemination, to drive future shifts in institutional vision, strategy, capability, capacity and funding decisions at higher education and government level, as well within the broader scholarly publishing community. Such a shift envisages a landscape in which local scholars have increased the intensity and value of scholarly publication in the local and global community of ideas, and where international scholars publish in rated African and Southern African journals alongside African scholars on topics of interest and value to Africa's communities.

The Southern African Regional Universities Association, as an organisation of the regional universities leadership, must break the existing paradigm, because individual universities will always function at the incremental level. SARUA's purpose is to 'foster and expand higher education and its contribution to the eradication of poverty, and the promotion of socio-economic and cultural development, human rights, and peace and stability in the region.' (Strategic Plan 2007 – 2012). It envisages its task as being to address the confluence between the 'capacity, training and research needs' of universities on the one hand and the 'social cultural and economic development priorities' of the region on the other (ibid). Thus, it falls to SARUA as the organisation of university leadership in the region, to act as a catalyst in setting the new paradigm. Universities in isolation cannot set a new paradigm, as the capacity to absorb, undertake and utilise new technologies and approaches to the university mandate is restricted and in competition with the many other claims for institutional change.

Changing systemic and institutional paradigms is an endeavour that institutions individually and collectively determine and grow into over a period of five to ten to 20 years, before which that paradigm becomes obsolete and requires new insights. Networks present greater opportunities for paradigm change than institutions, thus a concerted regional initiative towards open knowledge will constitute a greater force for change than myriads of initiatives at institutional level. On the other hand, where champions and early adopters of open knowledge are emerging, their efforts should be encouraged.

In Southern Africa, eight countries have only one to two public universities, while six countries have three or more public universities. A working proposition for the purposes of this study is that each country has at least one university in which there is a measurable degree of research and scholarly publishing, while all universities are engaged in postgraduate studies with greater or lesser attention to postgraduate research. Academics at a number of universities in the region are engaged in regional, continental or international networks for producing research and scholarly publishing, though the trend is to publish in and to use scholarly publications generated in northern countries.

The baseline study on science and technology and higher education (SARUA 2008a) documents an annual average output of 6 800 papers in ISI-journals between 2001 and 2007, with South Africa leading the output, followed by the cluster of Tanzania, Zimbabwe, Botswana and Malawi. Thus, universities in five countries produce more than 90 percent of the articles in ISI-journals. However, the study points out that this measure is inadequate because it does not include articles in local journals, books, book chapters or theses. It states that 'The reality is that there are very few sources on these other modes of knowledge production. Where such sources are available, they would require a data management effort that was beyond the brief of the study' (2008a: 6). This discussion points to three key issues: (a) the need to find a systematic way of recognising the broad range of knowledge produced in universities; (b) the need for mechanisms that will easily enable access to the knowledge generated in Southern African universities and (c) the number of articles accepted for publication in ISI-journals. Taken together, these issues indicate a sufficient basis for creating an open

knowledge platform on which to foster growing intensity in knowledge production and access in the Southern African region.

With due regard to the findings and analysis from this Opening Access to Knowledge in Southern African Universities Research Study, and the broader context for research and scholarly publishing, the main recommendations emerging from this research study are to:

(1) Adopt a Vision for Open Knowledge in Southern African Universities
(2) Establish a Southern African research publishing and dissemination platform

These recommendations are formulated in the context of the SARUA vision statement (Strategic Plan 2007 – 2012):

> 'As social institutions, higher education primarily serves the purpose of developing a cohort of citizens with a highly developed and critical intellectual capacity ... The contributions that higher education institutions make to issues such as poverty eradication, conflict resolution, human rights, gender equality, cultural development, global economic competitiveness and improvements in quality of life are extensions of this principle.'

The substance of the recommendations is set out in Sections 3 and 4 below.

3. Draft 'Resolution on Scholarly Communication: An Open Knowledge Vision for Southern African Universities'

Southern African scholarship is at a cross roads – it can either continue to decline in its significance or it can become a means by which Southern Africa engages in the global knowledge economy on its own terms. In response to this challenge, the universities of Southern Africa affirm that knowledge is the common heritage of humankind and should be widely shared and available for the public good, built upon by successive generations of scholars. Here, while restrictive copyright approaches may continue to dominate the publishing environment for a period, open approaches and open licences are gaining momentum. It can provide advantages to universities similar to those provided by the evolution and value addition from the open source software movement.

Open knowledge in the 21st century requires a new vision of scholarly communication for development. Open knowledge is in the finest traditions of human scholarship. It is in the nature of open knowledge that it is of the highest standards, since it is open to scrutiny and challenge. Open knowledge encompasses open research, open education and community communication.

As research encounters a complex world, it increasingly relies on co-operation and sharing across disciplinary and institutional boundaries to enable open and collaborative research. Scholarly communities which engage in open and collaborative research do so in the finest traditions of science and scholarship, in accordance with the African ethos of ubuntu, and with the most successful emerging practices of leading global research. Openness is characterised by use of open licences which facilitate use, revision, translation, improvement and sharing of knowledge by anyone. Openness is only possible with the determined use of interoperable technologies, open standards, and the sharing of research data. Research tools and the Internet should be open for all to use without cost being a barrier. Open scholarship requires open publication in the full range of scholarly communications, including peer reviewed open journal, books, monographs, and community communications. Open education encourages the participation of scholars in creating, using, adapting and improving on educational resources. Open scholarship is of great value and significance in the age of the Internet where knowledge can be freely communicated, assuming that the community of users have access.

We envision Southern African scholars increasing their research intensity and leading research, while ensuring that scholarly research, teaching and community involvement encourage the creation and utilisation of knowledge that is relevant, accessible, and useful to Africans. We envision Southern African scholars contributing in increasing proportion to global knowledge. We commit to a vision of scholarly communication which includes communication not only of scholar with scholar, but also of scholar with learner and scholar with community, where communication is mutual, respectful and open.

We call on governments and governmental agencies to effect policies and laws which empower Southern Africa's universities to use open knowledge for development.

We commit ourselves to this Vision for Open Knowledge in Southern African Universities.

'Flight Plan for Open Knowledge'

We will:

- Create and share knowledge and establish the expertise of our universities through open knowledge practices and the work of institutional champions;
- Create Southern African scholarly communities working for open education, open access and open research, and making unused and under used knowledge resources available through open access channels;
- Support the establishment and growth of international peer reviewed, open journals based in Southern Africa;
- Support the establishment of systems for peer review of open educational resources;
- Incentivise pioneers and early adopters of open knowledge practices in education, research and community engagement, and reward others who adopt such approaches;
- Establish scholarly communications as strategic functions of universities bringing together teaching, research and community engagement;
- Begin building the institutional systems and processes which will underpin open knowledge, including examining the promotion and reward mechanisms for open knowledge practices, including publishing research in and establishing and editing peer reviewed open journals;
- Establish systems for self reporting by academics of their use of open knowledge;
- Establish systems that enable universities to recognise and record all scholarly communications;
- Establish systems which enable scholars and universities to track the developmental and human impact of scholarly communications.

4. A Southern African research publishing and dissemination platform

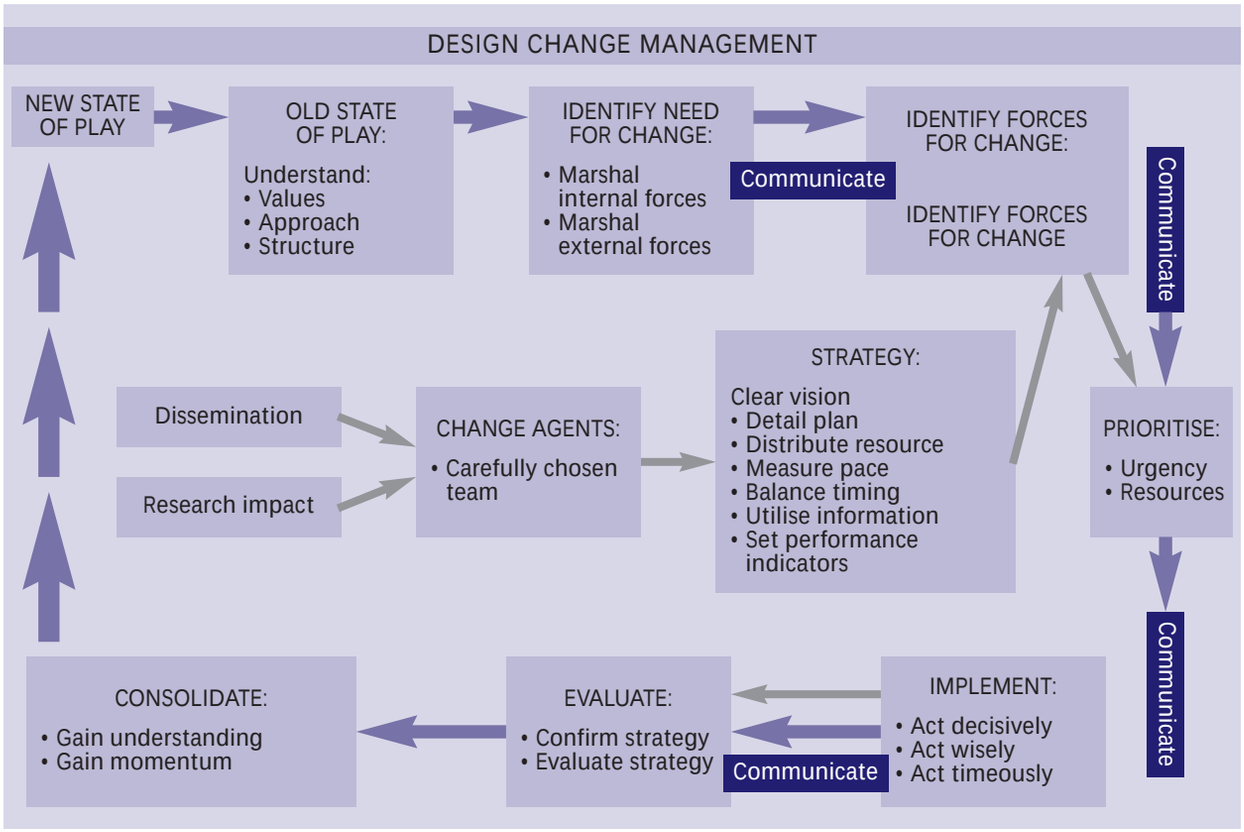
The objective of this recommendation is to create a common platform for the Southern African universities, that serves to significantly increase the volume of published research, profiles the work of publishing researchers and scientists in both the Southern African and international research communities, promotes quality in scholarly publishing, makes research and scholarly publication available to the broad academic and student population, particularly the postgraduate student population at low cost and promotes the utilisation of research output by a broader community of researchers and members of society.

The platform would have the change management logic, structural components and mechanisms as described in Diagram 1 on page 15. In order to arrive at a new state of play (new paradigm), the characteristics and weaknesses of the old state of play have to be understood with particular reference to the values, approaches, structure and systems that entrench that state. In order to shift out of the old into the new paradigm, a need for change must be established. This report presents the contours of the new paradigm

(Section 2), discusses the characteristics and weaknesses of the current arrangements (Section 3), and identifies the need for change as being to advance the volume, quality and accessibility of scholarly publishing and its value to the region.

Managing change in an environment where institutions have to undertake a major shift away from past custom and practice, requires a significant programme of communication and a prioritisation of actions across the range of stakeholders. Implementation of a programme, in this instance, establishment of a platform for organising and servicing the needs of scholarly publishing and dissemination, requires that the university leadership demonstrates a commitment to change despite obstacles in the path. Such commitment can be bolstered by fostering communities of interest and networks of scholars, training and development events, and nominating champions to build the consciousness of 'open knowledge'.

Diagram 1: Design Change Management



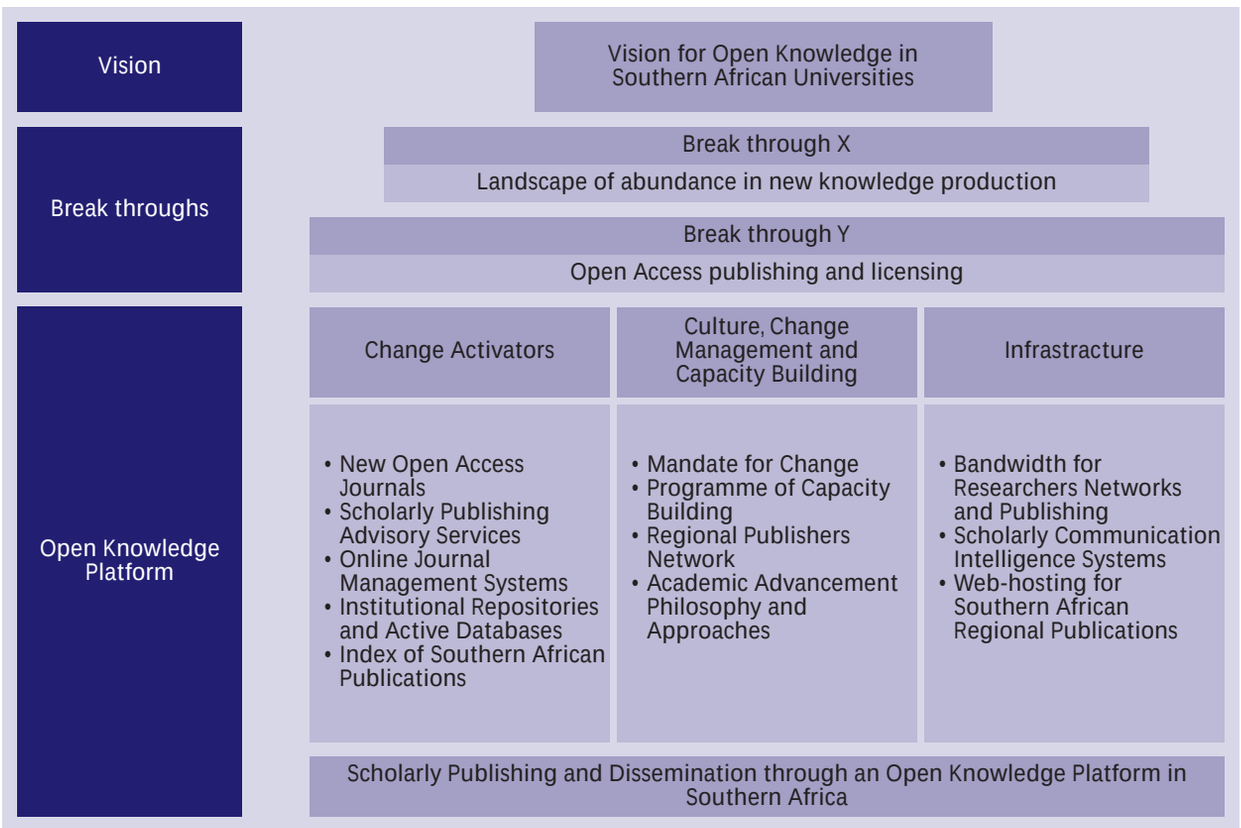
Adapted from: Sun Tzu

4.1. Paradigm change for opening access to knowledge

The 'new state of play' of open knowledge introduces the idea of open licences as alternative to all rights reserved restrictions, while retaining the rights of the knowledge creator to attribution and to decide whether and how his/her knowledge may be used for sharing or for commercial or non-commercial purposes. It introduces the ideas of open science and open research, all of which have the intent of inviting scholars to use and build on each others' work. Where these approaches have been used, the volume of scholarly publishing has grown and the increased value of knowledge to society has been recognised. Drawing lessons from experiences elsewhere and developing its own agenda, Southern Africa can leapfrog from its current position of limited knowledge production to a strong body of Southern African research in 20 years. This will require a number of break throughs which are discussed below as break through X and break through Y with the associated actions and change management requirements as illustrated in Diagram 2.

Achieving the Vision for Open Knowledge, through the two systemic break throughs requires attention to at least three inter-dependent components that together constitute the platform for scholarly publishing and dissemination. These are the five change activators, the five focus areas for change management and capacity building, and the two structural requirements with respect to ICT infrastructure.

Diagram 2: Open Knowledge Platform for Scholarly Communication



Abrahams, L & Burke, M (2008)

Break through X: A Southern African landscape of abundance in new knowledge production

In order to enhance the quantum and quality of scholarly research publication and dissemination (journals, books, informal research publications, theses and dissertations), a number of key interventions are needed to establish a more efficient and effective environment that makes Southern African academic research outputs available and easily accessible to scholars, students and practitioners. This requires, inter alia, the establishment of efficient and effective systems for publishing and dissemination throughout the entire landscape, as well as to issues relating to strengthening the technical platform for scientific journals and other outputs.

The question of what is commonly called 'grey literature' needs to be interrogated in a digital age, particularly in an African context. A substantial volume of research literature is produced in African universities and research institutions that is development-focused, but does constitute credible research output. In Australia, for example, in a report for the Department of Education, Science and Technology (DEST) Houghton et al. recommends that effective access to publicly funded research be achieved by 'ensuring that the Research Quality framework supports and encourages the development of new, more open scholarly communication mechanisms, rather than encouraging 'a retreat' by researchers to conventional publication forms and media, and a reliance by evaluators upon traditional publication metrics (for example, by ensuring dissemination and impact are an integral part of evaluation)' (Houghton et al 2006).

Knowledge production could therefore, be viewed as a pyramid where grey literature, theses and dissertations form the base of the pyramid and can be translated into peer-reviewed research publications: the larger the base of the pyramid, the larger the volume of activity at the middle and apex of the pyramid. This creates the future shape and size of research productivity. The unavailability of appropriate Southern African descriptive literature is a major constraint on the growth of research capacity. On the other hand, the large amount of work which has already been created but is not currently widely available constitutes a potential windfall for the change management process, which will give the process initial impetus.

In creating this field of play, it is necessary to concentrate efforts at the Southern African level through establishing a platform that encourages interaction among the actors in the scholarly publication and dissemination arenas across the region, rather than concentrating efforts at the institutional level which will drain any potential resources. The further motivation for this focus is that bringing networks of actors together in 'communities of practice' can move the paradigm into place through encouraging shared learning and adoption, as well as knowledge exchange and mobilisation across these communities. In particular, the focus should be on making scholarly publication, the work of researchers, scientists and students well known within this southern geography, with potential benefits for the next generation of students, researchers and increased citation rates across the Southern African scholarly community.

The areas identified for change management could include attention to peer review and publishing practices or a wider range of research literature; peer review processes for editors, editorial boards and publishers for journals, monographs and books; intellectual property rights issues in relation to journals, monographs and books; print, print-on-demand and Internet publishing issues for academic publishing; online publishing of theses and dissertations by libraries and librarians; the prestige and recognition of academic journals; measures to attract high quality publication in local (southern) journals.

Break through Y: Open access publishing and licensing

An advocacy campaign on open access publishing and licensing approaches should be conducted with universities and academic journals which originate from Southern Africa, over the period 2009 – 2014, introducing practical approaches that advance the utilisation of scholarly research publishing through, in particular, the introduction of 'creative commons' licensing. The objective of this campaign would be to create access to published research in ways which enable scientists and researchers to build on each other's published works, including the creation of derivative works, while acknowledging the original authors.

This approach can contribute significantly to increasing the volume of published research by substituting onerous copyright restrictions with open intellectual property mechanisms that work to the benefit of the authors and their research community and readership by increasing the utilisation of published research, increasing access to learning materials for the student community, and increasing access to research knowledge for the broader practitioner community.

4.2. Specific actors and actions

How do SARUA members create the new state of play? Who sets the wheels in motion for the new paradigm to take effect in institutions? Who is this for and who is interacting?

The many actors in this emerging landscape include unorganised 'communities of interest', which can be transformed into structured 'communities of practice'. Within the university environment are research producers, research managers, librarians and library services, university publishers and presses, IT departments, students and academics. Beyond the university boundaries are practitioners, academic publishers, governments i.e. ministries of education and science and technology and scientific advancement agencies, and funders. Specific actions are required to mobilise the context for each of these communities from an open knowledge perspective, with attention to both the print and online environments.

The shift in paradigm requires actions at the regional, national and institutional levels in Southern Africa, while paying due attention to initiatives already under way at the international and continental levels.

At the regional level, member institutions can embrace the Vision for Open Knowledge and put in place the building blocks of an open knowledge paradigm. In particular, the SARUA organisation and the participating universities as a collective, can take steps to introduce the change activators set out in the next section.

At the national level, university leaders in discussion with their national ministries of education and science and technology, and their national scientific advisory bodies must seek to conduct the conversation and debates regarding copyright and its alternative approaches, namely open knowledge, which have already entered the mainstream of academia in top universities in the United States of America and in developing countries such as Brazil.

At the institutional level, the Flight Plan for Open Knowledge provides a set of key directions that can launch the stored-up potential amongst researchers and scholars, research managers, libraries and librarians, undergraduate and postgraduate students and others participating in the broad frame of knowledge production. SARUA studies and publications, authored by academics and non-university based researchers, are already available under the Creative Commons Attribution-Non-Commercial-Share-Alike 3.0 Unported License (http://creativecommons.org/licences/by-nc-sa/3.0/). The adoption of flexible licences for the commercial production of print products and the commercial production of research-based publications for community use would contribute to wider access and increased social benefit from research production.

4.3. Change Activators

Five change activators are proposed. Operating together these activators can have the effect of generating highly effective access to knowledge for academics, researchers, students, practitioners and the broader community for ideas. They can also have the effect over time of contributing to an increasing rate of scholarly publication across the majority of universities in the region. Developing individual activators one at a time may have a limited effect on scholarly production and may ultimately fail to effect the required paradigm shift. While resources for adopting these change activators may be limited at the current time, they can progressively be built into institutional budgets and funding submissions to governments and the funding community.

4.3.1. Create a number of new open access peer reviewed journals to enhance the visibility of Southern African research

Within the region, there are existing networks of scholars, as well as academic journal and book editors who are interested in working in the new frame, but who may not be familiar with the particular approaches, licences and dissemination mechanisms relevant in the open knowledge paradigm. A Call or Expression of Interest could be tabled by SARUA for scholars and editors who wish to explore this domain. The invitation should include the offer to promote a limited number of open access journals through the provision of open source journal management software, training, advisory and other requisite services.

4.3.2. Scholarly publishing advisory services

Knowledge mobilisation is needed about how to publish in the new environment and what new capacities are required, inter alia, increasing the effectiveness of the publishing process in the electronic environment including peer review, journal management technology, skills associated with managing and implementing the new technologies, practices and processes associated with scholarly publishing; university policy on scholarly publishing and access to knowledge.

A number of potential partners can be identified in the region, on the continent and internationally, to engage in establishing and building an advisory service. These potential partners include the Academy of Sciences of South Africa (ASSAf), the Network of African Science Academies (NASAC) and the Latin American Regional organisation, the Scientific Electronic Library Online (SciELO).

The aim of this advisory service will be to engage with the challenges identified by the scientific organisations and the academic publishing fraternity, to collaborate on extending the lessons from publishing, and to provide advice to editors and editorial boards on issues relating to a regional technical platform to scientific journals. Among the many issues to be addressed, perceptions of the role of university publishers (both from the perspective of the university community and the academic publishing community), unnecessarily lengthy (unresponsive) peer review and publishing process, technical knowledge of publishing standards, knowledge of new technologies and infrastructure, knowledge of the market for academic publishing, business and financial models for academic publishing, services aimed at providing support to research networks for translating research material from 'grey literature' to scholarly publications should be included.

In particular, a Southern African active research repository can be created to encourage existing or emergent research networks to produce trans-boundary research within SADC. This can enable, inter alia, activities to enhance the quality of 'grey literature', building active collections and repositories for electronic theses and dissertations that provide a 'shop front' for Southern African scholars and research networks, the broad student community, in particular professors and their research students.

4.3.3. Online journal management systems

Researchers and editors can benefit from the introduction of online journal management systems in a number of ways, as these technologies allow authors to submit their papers or manuscripts online and potentially facilitate efficiency in the peer review process as reviewers can access documents and submit comments for revisions online, rather than waiting for postal deliveries; editors can check on author and reviewer progress; and documents are seldom, if ever, 'lost'. Such systems also assist in the creation of a well-designed and effective online presence for journals, supported by the necessary bibliographical information. However, introduction and concerted utilisation of the technologies to obtain real efficiencies and effectiveness require guidance to research producers, research managers and editors, on the strengths and weaknesses of various online journal management systems and support for the introduction of these systems into university and academic publishing environments.

4.3.4. Institutional Repositories and active databases

Guidance and advice to research managers and librarians is required regarding initiating, establishing, managing and marketing institutional repositories for electronic dissertations and theses, research papers, technical reports, cultural collections, pre-prints, post-prints of academic journal articles, journals and books. This should be developed out of existing initiatives undertaken in universities.

Institutional repositories can create the foundation for an index of Southern Africa publications that can be made available on the Internet and would be searchable by academics and students in the region and abroad. This can serve at least two important objectives, namely (a) making publications more easily accessible to academics and students in the region and (b) placing Southern African scholarly publishing in the international eye.

Institutional repositories and active databases can be transformed over time to place articles, books, journals, theses and dissertations, research reports and studies online. While this requires higher levels of ICT infrastructure and budgets than are currently available, this is a necessary goal to work towards over a 20 year period. The resulting value, namely placing knowledge at the hands of students and academics, is immeasurable and often leads to the improved use of existing ICT resources.

4.3.5. Index of Southern African publications

A web-based interface or 'shop front' Index of Southern African scholarly publications can be created as a next phase, working from institutional repositories or national databases of scholarly publications. Depending on the effectiveness of introducing some of the change activators described above, the Index can harvest information from online journal management systems, institutional repositories and university websites. This will enhance the capacity of librarians and library services

to provide services to students and academics, and will address the gap in information about local scholarly production referred to in the SARUA Science and Technology study of 2007.

4.4. Culture change, change management and capacity building

Six areas for attention with respect to culture change, managing change and capacity building are proposed:

4.4.1. Mandate for change

A mandate is required from the SARUA leadership, in order to facilitate the recommendations, processes, mechanisms and technologies to be deployed at a regional level. It is therefore proposed that SARUA at an appropriate meeting introduce, debate and adopt a 'Scholarly Communication: An Open Knowledge Vision for Southern African Universities.'

4.4.2. Programme of Capacity Building

An annual programme of capacity building should be developed for the selected communities of interest or communities of practice, as well as common events for the university community. This programme should include academic colloquia and a series of 3-day focus training sessions. A dedicated website linked to the SARUA website could be established, making available an annotated bibliography of the relevant literature on open knowledge and scholarly publishing, bringing awareness to the debates and discussions on the subject and incorporating links to sites which demonstrate the emerging trends in scholarly publishing.

The programme of events could be hosted by the many Southern African universities and university-based research networks, in collaboration with governments and scientific advancement agencies in the region.

4.4.3. Regional publishers and creating a regional publishing network

A regional scholarly publishing network can operate to draw lessons from the rapid developments in the field of research and scholarly publishing in the past five years across the international scholarly community, and bring these lessons into the practice of scholarly and university publishing in Southern Africa. Establishing and advancing such a community of practice should aim to design, build and operate publishers which provide a range of services required by authors and scholars in both the print and online environments.

4.4.4. Academic advancement and promotion philosophy and approaches

A tiered incentive structure for (a) publishing a wide range of open research literature; (b) publishing in country-level open scholarly publications with the purpose of significantly upgrading the quality of local research publication; (c) publishing in open international scholarly publications and (d) publishing in internationally rated publications can be designed.

SARUA should consider participating in a process for advocating for the establishment of an African Citation Index, in partnership with such as the African Academies of Science and Codesria, who are investigating the potential for such a development. This would have the purpose of fostering the development of African scholars, against which performance is evaluated, in addition to the commonly accepted country accredited and internationally rated publications lists.

4.4.5. Institutional arrangements

SARUA member institutions would need to design and adopt institutional arrangements to create the Southern African research publishing and dissemination platform. SARUA's role could include identifying potential partners to establish a consortium of institutions responsible for establishing and developing the platform. This consortium should include expert institutions and individuals, as well as leading university-based scholars and units and scientific advancement agencies.

4.5. Infrastructure

New technologies and new ways of disseminating scholarly publishing, typically using the Internet, offers solutions to the challenge of increasing the available and accessibility of scholarly publications across the region, both for future research and for educational purposes. These approaches are dependent on ICT infrastructure as well as software platforms for dissemination.

4.5.1. Bandwidth for research networks and publishing

In order to increase researchers' and students' access to scholarly publications from the Southern African region and internationally, on campuses where access to the Internet is established, universities will need to earmark resources to enable a shift to 'next generation networks' including high-speed bandwidth and quality of service over the next 5 – 10 years. Some countries are considering introducing national research networks or NREN's, offering dedicated capacity to universities. On campuses or in countries where bandwidth and therefore access to the Internet is limited, alternative approaches will have to be considered. The SARUA Status Review of ICT in Universities in the SADC Region (2008) proposes a regional REN as an infrastructure that all universities in the region can leverage. The detail of this proposal as it applies to scholarly publishing will have to be spelt out.

4.5.2. Scholarly communications intelligence systems

Researchers in Southern African suffer from an inability to locate relevant knowledge resources. Scholars are not aware of the research produced in the region. A more comprehensive picture of what research and academic output exist is required and should include the full range of output such as final research results in peer reviewed books or journals, research in progress, open educational resources, undergraduate and post graduate student research, public lectures, public informational materials and the like. It is the availability of knowledge for combination and recombination that yields essential insights subject to rigorous authentication.

The introduction of scholarly communications intelligence systems could contribute significantly to tracking the scholarly output produced by academics and scientists. It should be premised on recognising, recording and evaluating the full range of scholarly communications. It should allow users to assess the type, quality, openness and relevance of each resource, and to create and modify links between resource records. Intelligence systems do not themselves contain the materials but have links to the materials. Such scholarly communications intelligence systems should not simply report on the communications which have taken place, but also enable the evaluation of the human and development impact.

4.5.3. Web-hosting for Southern African publications

Web-hosting of publications is an essential feature of the change activators proposed above. A regional web-hosting model could be considered as a key capacity-building initiative.

4.6. Further Research

Among the many problems made explicit and the many proposals advocated by key informants during the course of this study, the proposal for an African Citation Index stands out. This would require a dedicated study and set of recommendations.

A further item discussed in this study, but which was not reviewed or considered in any detail is the challenge of raising the volume of publishing in rated international journals. This question will require further study with respect to, inter alia, collaboration on African projects on scholarly publishing and access to knowledge aimed at increasing the base of publishable subject matter and content. Further research into the measurement of the social and economic impact of research could strengthen the case for investing in research.

Further research on the modalities of making bandwidth available for scholarly publishing and dissemination purposes is required. This together with an enhanced understanding of data management with reference to building an integrated data curation and dissemination system that is interdisciplinary, inter-institutional and operates across nations and regions, could provide insights into the technical requirements for strengthening open scholarly publication.

PART II

The framework and recommendations discussed in Part I are developed in response to a review of the background and the discourse pertaining to open knowledge, and discussion of the findings of the Opening Access to Knowledge in Southern African Universities Research Study.

5. Background to the Opening Access to Knowledge in Southern African Universities Research Study

Knowledge production, communication and dissemination is becoming central to the missions of all universities in the 21st century, thus enabling a shift beyond teaching towards research and civic engagement. The Internet and other collaborative technologies are changing the way universities conduct their business by making it possible to conduct collaborative research across disciplines, institutions and countries; making it possible for researchers and students to share working research and publications online and promoting e-learning for undergraduate and post-graduate programmes.

This creates the opportunity for African universities to participate in global knowledge production activities with significant potential gains through, *inter alia*, increased resources for research and publication in local and international academic journals. For institutions operating in developing countries within resource-constrained environments such as SARUA member institutions, these technologies and associated practices offer tremendous opportunities for improving research, publishing and dissemination processes and putting Southern African knowledge at the service of local economies and societies. The critical question is whether we are positioning our institutions to take advantage of these opportunities.

This question can only be answered if we understand the present constraints to knowledge production and dissemination within our universities and the extent to which collaborative technologies and its associated practices can contribute to increasing our capacity for generating new knowledge and expanding existing knowledge. SARUA has, in collaboration with the International Development Research Centre (IDRC), conducted a research study entitled *Opening Access to Knowledge in Southern African Universities* which examines the issues of 'access to knowledge' constraints and the potential contribution Open Access approaches can make to increasing research output.

This is a qualitative study, thus exploring the views, perceptions and attitudes of respondents to create a picture of the key concerns they have in respect of constraints to accessing and disseminating knowledge. The study was designed to identify a broad range of issues in exploratory mode rather than investigate any of the issues that surfaced in great detail. The specific research questions for investigation were:

1. What are the existing constraints to availability of academic and other relevant research publications in the social sciences and humanities, the health sciences and the natural sciences and engineering?
2. Are Southern African universities changing their practices relating to production and dissemination of research and publications and, if so, how?
3. How can Southern African universities increase the availability of academic and other relevant research publications to students and researchers?
4. What measures would be required to encourage new approaches to knowledge production and dissemination in Southern African universities among librarians, research managers and prominent researchers/scientists?
5. How can open access benefit and contribute to scientific collaboration and endeavour, and what are its implications for research across higher education institutions throughout the region, given the current limitations confronting Southern African universities?

The next section describes the context within which the results of the study should be interpreted, followed by a description of the study design, findings and recommendations and conclusions.

6. Changing university knowledge production and communication context[2]

The study is located within the context of changing trends in university knowledge production, scholarly publishing and the development of 'open access' approaches to disseminating research and scientific output.

6.1. Universities and knowledge-based development

Across the globe, it is generally understood that the Higher Education (HE) academic endeavour has, as its core purpose, the function of creating, teaching and sharing knowledge. The advent of new information and communication technologies (ICTs) has, in the last decade, brought about profound changes across the world in the ways in which knowledge is produced, how it is disseminated, and its potential to impact positively on social and economic development, nationally and globally. These perspectives emphasise different aspects of the knowledge production and dissemination process and the roles of various actors. Such technologies affect practically all aspects of the knowledge production and dissemination enterprise resulting in the emergence of a new mode of knowledge production. Houghton (2003, p.126) concludes that this mode of knowledge is increasingly characterised by greater emphasis on interdisciplinary, multidisciplinary, trans-disciplinary research; enhanced diversity in the locations of research activities; an increasing focus on problems, rather than techniques; and more emphasis on collaborative work and communication. This leads to the creation of new information access and dissemination needs, since there is an increase in the demand for access to a wider range of more diverse sources; for access mechanisms that cut across disciplines; and for access to, and management of non-traditional, non-text objects.

This, in turn, raises the question of how research publication policies and practices are responsive to the changing environment and how the landscape of scholarly publishing is changing to meet the needs of local and global knowledge communities. In particular, countries in Southern Africa need to evaluate what trends in this rapidly-changing scholarly publishing landscape best suits the region's own goals and how it can balance these against the pressures of international competitiveness in scholarly and university rankings.

Developing countries, especially in Africa, face a broad spectrum of research infrastructure and capacity constraints that limits their capability to produce scientific output, and absorb scientific and technical knowledge. Unequal access to information and knowledge by developing nations that is exacerbated by unequal development and exchange in international trade, serve to reinforce the political and cultural hegemony of developed countries. The impact of knowledge-based development will continue to have insignificant impact for as long as this asymmetry in research output and access to up-to-date information remains (Chan, L., & Costa, S. 2005). It is noted, however, that Southern African universities are investing in ICT infrastructure (SARUA, 2008), though current infrastructure levels remain very low compared to the needs for student access and high bandwidth.

One of the major priorities for addressing Africa's development challenges should be knowledge production by African researchers working primarily at African institutions, focusing on locally relevant knowledge production, which is made available to Africans. According to Sawyerr (2004, p.218), this insistence 'on African research and researchers at African institutions is to ensure rootedness and the sustainability of knowledge generation, as well as the increased likelihood of relevance and applicability. This condition

2 The material in Section 6 is from the International Overview of Open Access Opening Scholarship project in the Centre for Educational Technology at UCT, supported by the Shuttleworth Foundation. This work, authored by Eve Gray and Cheryl Hodgkinson-Williams, is available on a CC-BY-SA licence. http://www.cet.uct.ac.za/OpeningScholarship

presupposes local institutions and an environment adequate to support research of the highest calibre and insists upon the rootedness of such research as well as its positive spill-over effects on the local society'.

The contribution universities can make to scientific knowledge production and application places these institutions at the centre of knowledge-based development efforts, particularly in Africa. According to Sawyerr (2004), 'the strength of Africa's universities and research institutions is a key condition for its development, and their weakness is an index of, as well as a contributor to, its poverty'.

Scholarly publishing is important for disseminating and validating research results and moreover, provides an indication of the knowledge production and research capacity of countries and regions. Sub-Sahara Africa has a low publication rate relative to other developing regions, and suggests a 'problem of knowledge diffusion for the region and possibly low knowledge generation' (Ondar-Okemwa 2007). If Africa is to meet its urgent development needs the marginalization of African research produced by Africans, out of Africa would need to be reversed (Gray 2006).

The onset of economic decline and fiscal problems in the 1970s and 1980s associated with the introduction of structural adjustment in many countries in Africa, left African universities without much needed resources to carry out research. According to Assie-Lumumba (2005), university systems from the late 1970s to the 1990s was characterised by a great instability, with numerous lost years, strikes by both students and teaching staff, and confrontations between students, faculties, administrations, and governments, often followed by sporadic or prolonged closures. Infrastructure such as libraries, bookstores and research facilities collapsed; a serious shortage of books, laboratory equipment and research funds was experienced; and conditions of inadequate teaching personnel and poor staff development and motivation prevailed.

Ondar-Okemwa (2007) categorises constraints specific to knowledge production and dissemination into economic (inadequate funding and budgetary cuts, lack of incentives, brain drain) technological (Internet connectivity and telecommunications infrastructure) and environmental factors (freedom of expression). Kanyengo (2006) identifies the non existence of information policies for handling information, poor ICT infrastructure to manage the preservation of knowledge resources, inadequate financial resources, and the lack of technical knowledge and legal barriers as the key impediments to preserving information resources as inputs into knowledge production. In spite of these constraints, taking full advantage of the new electronic forms of communication for research and research capacity building in Africa, could open up access to knowledge and research findings worldwide, and present exciting opportunities for plugging African researchers into a flexible knowledge system and enabling them to leapfrog to the frontiers of knowledge (Sawyerr 2004: 227). The scholarly publishing system has an important contribution to make in this regard.

6.2. Universities and scholarly publishing

While patterns of research practice are changing dynamically, these changes are not reflected in the scholarly publishing models that continue to dominate promotion and reward systems in universities worldwide. The traditional tenure system of academic advancement – adopted in research reward policy in most African countries – bases promotion and tenure predominantly on publication in journals listed in the international citation indexes and the publication of books and monographs in university presses. Traditional scholarly publishing therefore retains a powerful role in higher education worldwide, bolstered by the inherent conservatism of scholars and by the power of the large commercial publishers.

The tradition of scholarly publishing began in the English-speaking world with Oldenberg's publication of the first issue of *Philosophical Transactions of the Royal Society of London* in 1650. However, the journal publishing system that scholars now treat as 'traditional' is in fact a product of the development of the knowledge economy, becoming strongly commercialised in the wake of a number of post-World War II developments. Responding to the recognition that there was commercial value in scientific knowledge, commercial publishers progressively replaced the learned societies and other small publishers who until then had dominated journal production (Guedon 2001). These commercial journal publishers have, in the

last decade, become consolidated into multinational corporations that dominate the production of research publication. Linked to these developments, a set of quantitative metrics came to dominate the ways in which the status and quality of scholars was evaluated, intensifying the hold of commercial publishing over the university research system and consolidating the dominance of research from the global North. The effect of this system of scholarly evaluation is to push developing countries, defined in this system as peripheral and 'local' even further to the margins in an already unequal global knowledge system.

Moreover, it is increasingly recognised that universities (and their academics) have received a poor deal from the system of private, subscription-based access to knowledge production. Consider the fact that the university or research funder supplies the content (the research), pays for the authoring (the time of the researcher writing the article), and provides and pays for the time of peer reviewers and academic editors. In addition, it often pays page charges or formatting charges to publishers. It then cedes copyright and finally buys back its own research at prices which have escalated at four times the rate of inflation in the past decade and a half. A cost benefit analysis conducted for the Australian government has identified the hidden costs associated with this system and has also attempted to quantify the losses incurred from reduced research impact as a result of the limitations imposed on access to research information as a result of high prices. The findings were that the hidden costs were very high and that substantial benefit could be gained from the more direct impact of research findings that would be achieved from open dissemination (Houghton, Steele and Sheehan 2006).

The commercial model of disseminating research does therefore not obey the rules of supply and demand and a relatively small number of 'core' journals occupy monopoly position in that university libraries have to subscribe to access their content, whatever the cost, because these journals have been established as 'must-have' resources. The practice of 'bundling' (in which a number of journal titles are sold under a single subscription) does offer the advantage of bulk pricing, but it reduces the room for choice, as the bundles consume such a large percentage of library budgets that libraries are unable to subscribe to smaller, individual titles. In addition, the inflexibility of indexing systems makes it difficult for new journals to establish themselves; thus compromising the potential for smaller niche subjects and newer inter-disciplinary areas (Willinsky 2006; Chan and Costa 2005; Lor and Britz 2004). However, given the potential for the Internet to offer instant global distribution of research content, the global inequalities engendered by the commercialisation of scholarly publishing are increasingly being recognised and are being challenged by new forms of online publication, in particular the open access model.

6.3. The emergence of Open Access publishing

Open Access refers to permanent, online access to full-text papers, free for all users. This means that papers may be read over the Internet, printed and distributed for non-commercial purposes. Open Access assumes two important dimensions: materials are made freely available and the copyright holder agrees to unrestricted reading, downloading, copying, sharing, storing, printing, searching, linking and crawling (Suber 2005).

Open Access approaches, frameworks and models promise to create opportunities for the participation of African universities in global knowledge production activities at the service of local economies and societies. Open approaches are premised on the conception of information and knowledge as a public good, rather than a commodity that, as Lyotard (1984 p.5) foretold, will be produced in order to be sold; is and will be consumed in order to be valorised in a new production.' As a public good, it gives rise to open institutional innovations and practices that lead to socially efficient outcomes. As a commodity over which intellectual property rights are assigned, it conveys a monopoly right that prevents ideas from being used to satisfy the needs of society (David 2002, p.6). In the resource scarce environments in which African universities find themselves, the institutions and practices based on the 'knowledge as commodity' conception will further adversely affect access to knowledge since the resources are not available to pay for knowledge as a commodity.

There are two primary routes by which Open Access research can be disseminated. Firstly, Open Access Journals make content available freely on the Internet. Open Access journals operate all the functions of a

traditional journal, including peer review. The second route is by means of Institutional Repositories and involves archiving articles already published in the author's institution and made available on the Internet free of charge. Institutional archives do not perform peer review processes and can include un-refereed pre-prints and refereed post-prints as well as other research outputs such as research reports, technical reports, policy briefings and theses and dissertations.

The idea of Open Access publication emerged in the wake of scholars' protests in North America and Britain in 2002 against the escalating costs of journals and against what they perceived as the exploitative subscription models of digital journal databases. Turning the conventional commercial model for journal publication on its head, the idea emerged that investment in the initial stages of the supply chain, (instead of paying subscriptions at the end of the supply cycle), would mean that journal content could be delivered online free of charge.

The initial idea of online publishing was that journals would be funded by author fees paid once an article was accepted for publication. The journal would then be available, full text online, free of charge. This 'author pays' model was subject to some criticism, as many felt that it would disadvantage authors from developing countries and from disciplines, such as the humanities, that were not well endowed with research funding. Subsequently, most Open Access journals have offered discounts or waivers to authors (which in reality most often means institutions or research funders) and those who cannot afford the author fee. In the African context it is likely that if an 'author pays' model were to be introduced, it would need a secure line of government or institutional support. Moreover, it is increasingly emerging that Open Access journals use a variety of sustainability models and many do not depend upon author fees, but use advertising, sponsorship and institutional support to provide a revenue stream for their publications.

The Open Access publication model thus offers online access, free of charge, to peer-reviewed journal articles and conference papers, as well as to technical reports, theses and working papers. There are no price barriers or restrictions on access to these materials. They can be used for research and teaching and are also readily accessible to people outside of the academic system (Swan 2005). Open Access publication removes the price barriers which block access to global knowledge and makes developing-country research more accessible because, in the Open Access model, it is not competing for subscription budgets in libraries that are struggling to subscribe to mainstream Northern journals.

Open Access publication does not, as some authors fear, lay them open to unregulated use of their content. This form of publication does not waive copyright protection but uses a copyright licence in which an author chooses to release the work free of charge, but may well retain some rights, such as attribution or the prohibition of commercial uses of the work. Free copyright licences are the legal basis on which open access publication, open educational resources and open knowledge generally operate. Free copyright licences rest on statutory copyright law in the same manner as exclusive licensing schemes. In both cases the rights vest in an author, or other rights holder, who then permits uses of the work subject to certain conditions. The most prominent free copyright licences are the GNU General Public Licence which is used for software development and the Creative Commons suite of licences. Free copyright licences are royalty free; there is no charge for the content. However, that is not why they are referred to as free licences – instead it is a reference to the liberty which the licences confer on users to make use of the work.

Anyone who complies with the terms of the licence can engage in the permitted uses of the work. Creative Commons licences reserve some rights to the author (or subsequent rightsholder). The most appropriate licence for scholarly publication and open educational resources is the Creative Commons Attribution Share-Alike licence. The most prominent right which is reserved from a scholarly perspective is Attribution, the right of the author to be known as author of the work. Under the Attribution element, an author may require that those who use the work subsequently notify their users that the original work is available at a particular URL. Properly managed, this can ensure that subsequent users know where to find an authoritative original of a scholarly work. The Share Alike requirement necessitates that anyone who re-works the original scholarly work, for example by translating it, must licence the re-work under the same terms. This requirement prevents the appropriation of scholarly material, no-one is permitted to build on an open work and

then close off the results. In this way the available pool of scholarly material is continually expanded. Use of a Creative Commons licence does not require the expense and delay of hiring a lawyer to license each work since the licences can be generated directly at the Creative Commons website (www.creativecommons.org).

One obvious and very beneficial difference is that publication can be much faster. An electronic journal does not have to wait to assemble an issue before publication and so articles can be posted to the journal as soon as they have been accepted and edited. Another is increased citation, a function of the increase of readers by several orders of magnitude.

7. Study design

The research study is a multi-country, cross-sectional study. A qualitative approach to the analysis of semi-structured interview data was used to investigate the existing constraints of access to knowledge for research and teaching within the university context in Southern Africa. It further sought to gain insights into the meaning of open access for scientific collaboration and endeavours, and the wider implications for research across Higher Education Institutions (HEIs).

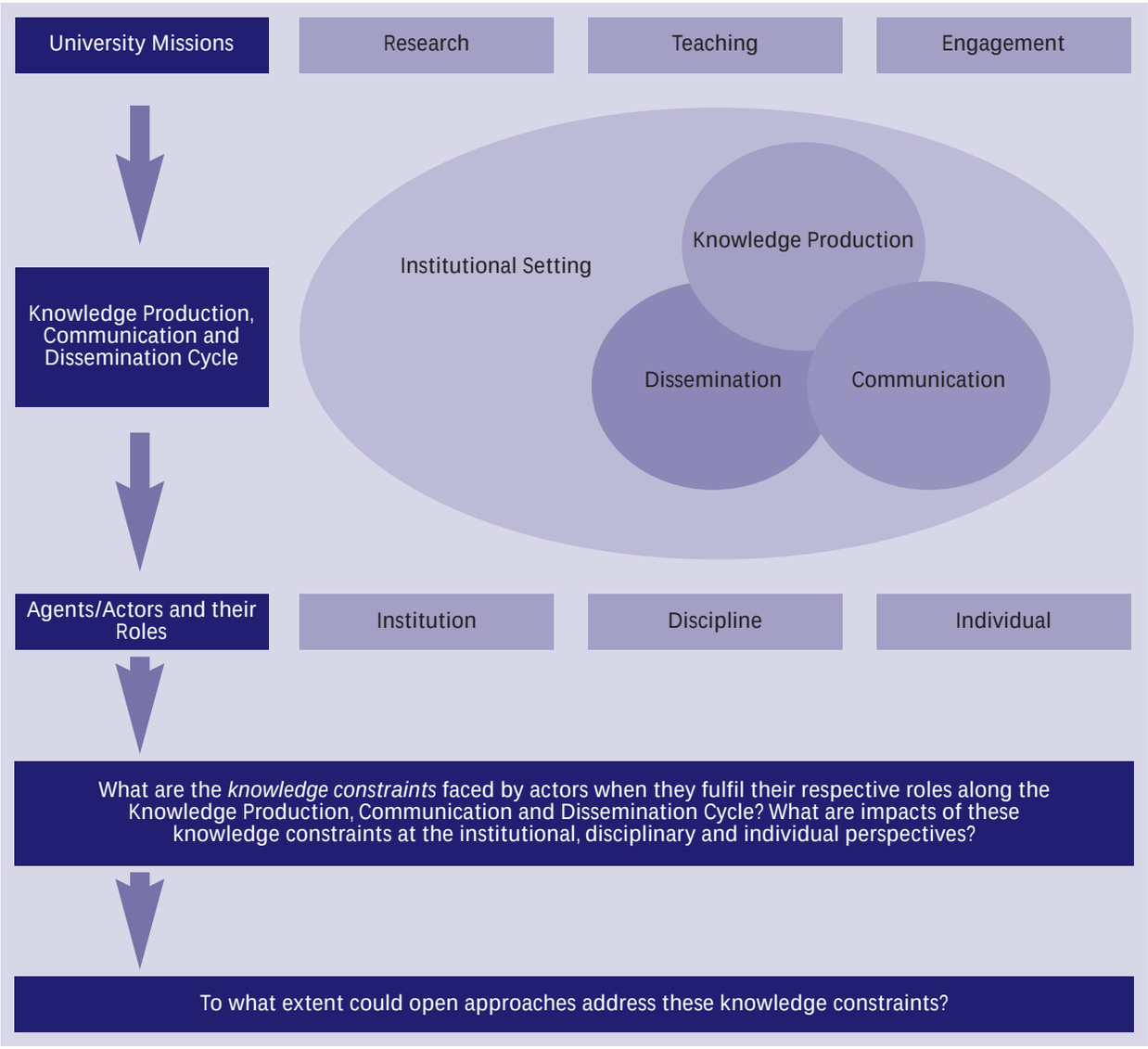
As a starting point, a conceptual model was developed as an organising principle to provide coherence and a framework for the collection and analysis of the data. The constituent concepts of the framework against which the data was assessed and interpreted are: the emergence of the knowledge society; the role of universities in the knowledge society; the contribution of universities to knowledge production; open frameworks and approaches to knowledge production and its relevance to universities in Southern Africa.

7.1. Conceptual model

The study is framed within the context of how knowledge production enables the achievement of research, teaching and engagement missions of universities. More specifically, the knowledge chain is viewed from a process perspective consisting of knowledge production, processing and dissemination, which takes place in a university's institutional environment. Each of these processes and the institutional environment are impacted by the increasing pervasiveness of modern information, communication and networking technologies. These technologies, in turn, contribute to, and provide the impetus for, the emergence of new modes of knowledge production, processing and dissemination.

The emergence of open approaches and frameworks is one such institutional innovation that takes advantage of the embedded networking and collaboration properties of such technologies and which could contribute to addressing existing knowledge constraints. The study therefore sought to investigate the existing knowledge constraints experienced at the institutional, disciplinary and individual levels within the knowledge cycle, while at the same time determining the extent to which open modes of knowledge production can assist in addressing these constraints. The model is illustrated in Diagram 3.

Diagram 3: Conceptual model



7.2. Sample

Eight universities from seven countries were selected to participate in the study. A purposive sampling approach was used to select the key informants situated within the pre-defined criteria for the study. The criteria used in formulating the categories of respondents were information-rich and knowledgeable people involved in science and research within a university context. More specifically, respondents were selected based on their positions in respect of university institutional and disciplinary structures. A total number of 104 interviews were planned. Only 89 respondents were interviewed due to time and logistical constraints. Six of these interviews were case studies aimed at identifying practical measures that are currently implemented within universities to encourage new methods of disseminating knowledge. The sample of respondents interviewed from each university was as follows:

Table 1: Sample of key informants at selected universities

UNIVERSITIES	Institutional				Health and Life Sciences			Natural Sciences and Engineering			Humanities and Social Sciences			
	DVC: Research	Head of Library Services	University Press	Case Study	Dean	Senior Researcher	Academic (Teaching)	Dean	Senior Researcher	Academic (Teaching)	Dean	Senior Researcher	Academic (Teaching)	**TOTAL**
University of Botswana	1	1	0	0	1	0	0	0	0	0	1	0	0	**4**
University of Dar es Salaam	1	1	1	1	1	1	1	1	1	1	1	1	1	**13**
Eduardo Mondlane University	0	1	1	1	1	1	1	1	0	1	1	1	0	**10**
University of Malawi	1	1	1	1	1	1	1	1	1	1	1	1	1	**13**
University of Mauritius	1	1	1	1	1	1	1	1	1	1	1	1	1	**13**
UNISA	1	1	1	1	1	1	1	1	1	1	1	1	1	**13**
University of Pretoria	1	1	1	1	1	1	1	0	1	1	1	1	1	**12**
University of Zambia	0	1	1	0	1	1	1	0	1	1	1	1	1	**11**
Total	**6**	**8**	**7**	**6**	**8**	**7**	**7**	**6**	**6**	**7**	**8**	**7**	**6**	**89**

7.3. Data collection and analysis

The study employed a combination of descriptive and explanatory methods, using literature review and semi-structured interviews to generate the data. The purpose of the literature review was to identify and explore the core concepts underpinning changing knowledge production and dissemination processes within the context of the university mission. These concepts provided the basis for the formulation of the conceptual model, illustrated in Diagram 3. The semi-structured interviews provided an opportunity for key informants to describe and explain their views on the research questions in more depth.

Researchers were identified and appointed in each of the countries from which the universities were selected. The data collection process took place over a twelve week period between May and July 2008. Researchers recorded the interviews in digital format. Sixty percent of the interviews were recorded successfully and transcribed. The transcribed interviews, together with the detailed notes of each researcher for each interview formed the basis for the thematic analysis.

Thematic analysis was the chosen method for the analysis of the data as it provides a useful way of recovering structures of meaning that are embodied and represented in text. A grounded approach was used in the development of a coding structure. This involved a line by line review of a sample of transcripts to generate a list of categories. This initial list of categories were tested against a second sample of transcribed interviews and amended appropriately. In addition to assisting with the identification of themes in the text, the coding structure also served as the basis for generating statistical descriptions from the data. Repeated reading of the transcripts and reports provided the opportunity to review and compare the codes against emerging themes from the analysis, as a way of ensuring validity. An Excel database was developed to capture, index and analyse the transcripts and reports. Continuous review of analytical notes and re-analysis was undertaken to ensure reliability.

7.4. Limitations

Other inhibitors of research and scholarly publishing such as whether or not research is well-funded, whether or not there are researchers with the necessary expertise or at the relevant level of academic seniority to lead research projects or whether the necessary research infrastructure is available, are not addressed in the scope of this project. The focus of the study is limited to access to knowledge for the purposes of research and scholarly communication, so that the recommendations made in sections 3 and 4 are limited to addressing access to knowledge constraints for improving scholarly communication.

8. Findings and discussions

The findings are organised into four main sections. The first section examines how research output is used for teaching and learning, as well as further research. The second section highlights the constraints to accessing and disseminating knowledge. The third section focuses on the perceptions respondents have of open access approaches, whilst the fourth part of the analysis of the data revealed that the issues identified are perceived by respondents as an interrelated and interdependent series of issues concerning constraints to knowledge, particularly from the perspective of accessing and disseminating knowledge. The findings are discussed below.

8.1. Research utilisation and practices associated with accessing knowledge

The Internet has become an integral part of research, teaching and learning within the universities, according to respondents. Academics are increasingly using the Internet as an aid in their teaching activities and they encourage students to use the Internet to retrieve information and undertake research for doing assignments. Often course materials will include website addresses as part of the bibliography for a particular course.

Academics confirmed the importance of research and publication in supporting teaching and learning activities in universities. All the academics interviewed were unequivocal in their view that research is the basis for teaching and learning. The following statement by an academic in the Humanities and Social Sciences aptly captures this view: *'Teaching can only be credible if it is based upon research. You can't light the fire of intellectual engagement unless you show students that research is exciting'*. Academics also acknowledged that research is less influential at undergraduate level than postgraduate level, but that it is 'vital to start at undergraduate level'. Moreover, research plays an important role in curriculum development in that it enables continuous improvements in response to changing environments and practices. This was particularly emphasised in the Health and Life Sciences where applied research continuously leads to new discoveries that have impact – for example, clinical practices. In addition to research serving as the basis for teaching, various unintended benefits may be derived from research projects especially in resource constrained environments. An academic in the Health and Life Sciences, for example, cited how research equipment such as dust tracking equipment acquired through a research project is used by lecturers and students for teaching and learning purposes.

Researchers source material for conducting research from a variety of scholarly outputs. These include journals, conference papers, monographs, book chapters, books, working papers, research and technical reports and databases. Journals, according to respondents, remain the preferred means of communicating scholarly work and were the most often cited medium of communicating research output. Conference participation and the delivery of papers at these gatherings of academics and professionals was cited as another important medium for accessing cutting-edge research, while at the same time providing the opportunity to engage with peers and communities.

Increasingly researchers use the Internet in various ways to participate in research communities, stay abreast of the latest developments in their field and find research outputs that feed into their own research work. Electronic journals, institutional repositories, subject-specific repositories and, in a few cases, personal websites are becoming important sources of research information. The motivation to go online is driven by the need for quick and convenient access to information relevant to their research.

While not everyone is satisfied with the service they receive from a library, there is a general consensus that libraries play a critical role in making research available and can potentially play a far greater role in disseminating research output. According to respondents, the information skills of library staff and the role of libraries in respect of acquiring, organising and managing information resources, positions libraries to play a more important role in making knowledge available.

Use of research material produced in the Southern African region appears to be discipline-specific and dependent with Health and Life Sciences making much greater use of research published in the region. According to respondents within the discipline, this is because of the close association between research and practice. Most research undertaken in this discipline is context-specific applied research with a focus on solving community health problems and improving clinical practice. The research in the Natural Sciences and Engineering, and the Humanities and Social Sciences disciplines has more of a universal application and is focused on global developments. Nevertheless, respondents acknowledged that it is important to strengthen curricula with research and scientific outputs from the region. Accessing research from the Southern African regions is, however, constrained by several factors discussed below.

8.2. Constraints to accessing and disseminating knowledge

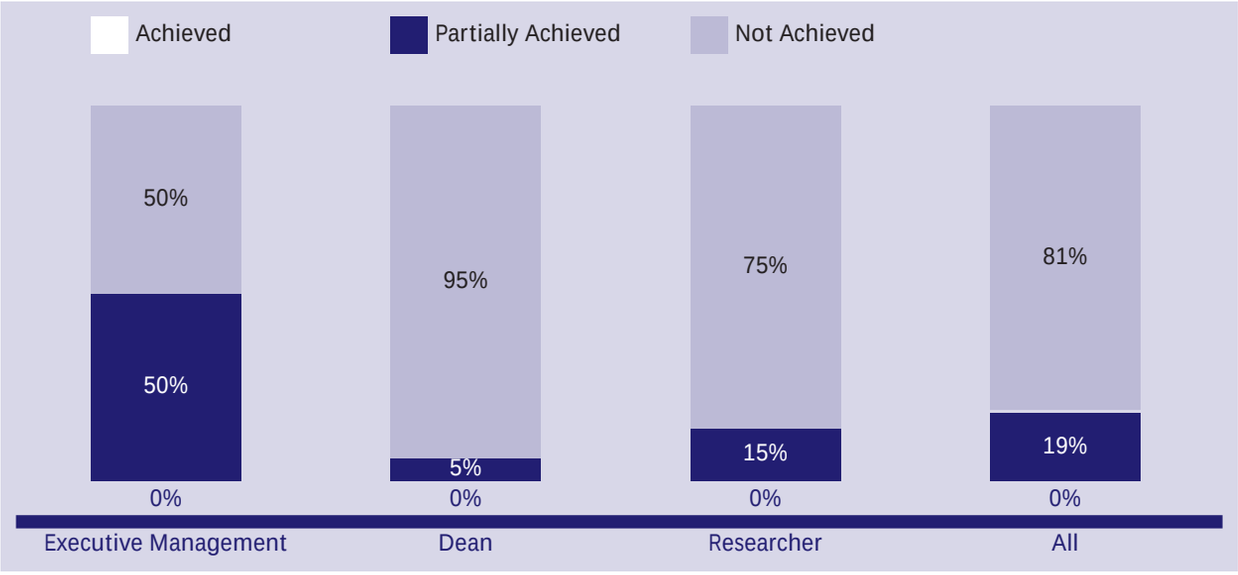
Knowledge is the foundation on which the three traditional missions of academic teaching, research and social engagement is built. That is, at the heart of academic enterprise. Academic teaching emphasises the transfer of knowledge from the academic to the student. Research focuses on conducting scientific and social science research and on publishing the results of the research. Community engagement tends to be limited to localities immediately bordering the university and is aimed largely at providing students with a platform for practical learning and testing the application of their theoretical knowledge (Abrahams: 2005). However, increasingly, as African governments demand that research be responsive to development needs, universities are having to engage with the relationship between research and social responsiveness, in which scholarly engagement with communities can feed back into further research production in universities (Favish: 2006).

Knowledge production and dissemination, underpinning the core activities of universities, are complex processes that occur through multiple interconnected and overlapping processes which are continuously evolving (Phillips, KPA: 2006). Knowledge production, according to Nentwich (2003: p.22), refers to the research processes related to information gathering, data production, analysis and management. Knowledge is both an output and an input since it is applied in the process of producing knowledge (Houghton: 2003). Hence, the ability to access knowledge and to disseminate and communicate it is vital for the knowledge production process. Little benefit will therefore be derived if knowledge is not disseminated or distributed. Dissemination, in the university context, refers to publication and teaching. Teaching is regarded as the rapid transmission of knowledge, while publication is regarded as the nucleus of formal communication among academics (Nentwich 2003: p36).

While the study set out to determine both the constraints to accessing and disseminating knowledge, it was found that these are different sides of the same coin. Factors constraining access to knowledge inevitably have an impact on dissemination of knowledge as the same channels of communication are used for both. Constraint to knowledge was examined in the context of whether universities are able to meet their research and publishing objectives. The extent to which university, faculty and departmental research objectives are met is discussed and examined, before the constraints are identified.

Given the importance of research in the knowledge production process and publication of the research output, executive managers responsible for research (Deputy-Vice Chancellors or Executive Directors for Research), faculty management (Deans) and senior researchers were asked to what extent the universities or faculties to which they belong are achieving their research and publishing objectives. Figure 1 shows that more than 80 percent of respondents indicated that the university and faculty research and publishing objectives are not achieved. Half of the executive managers responsible for research indicated that the research and publishing objectives of their universities are partially achieved, while the other half indicated that it is not achieved at present. Deans of faculties across the health and life sciences, natural sciences and engineering and the humanities and social science disciplines unequivocally indicated that faculty research and publishing objectives are not being met. In this instance, 95 percent of the Deans noted that the research and publishing objectives of the faculty are not achieved. This view was also expressed by three-quarters of the senior researchers interviewed across the disciplines.

Figure 1: Achieving research and publishing objectives



The views of the respondents should be considered in the light of the relative importance of the sampled universities to the science systems in their respective countries. For instance, researchers at the University of Botswana produce 95 percent of all academic journal articles, while the University of Zambia and the University of Dar es Salaam produce the highest research output in Zambia and Tanzania respectively (SARUA: 2008a). More disturbing, however, is the rate at which sub-Saharan Africa has fallen behind in respect of the global share of scientific output. A study undertaken by Tijssen, cited in the SARUA Science and Technology Study (Ibid, pp 29-30), shows that the region has lost about 31 percent of its share of scientific output as measured in papers published in ISI-indices.

The most often cited research and publishing objective relate to publishing in accredited journals, solving development problems, prestige and recognition, and meeting national development objectives. Executive managers responsible for research were more concerned with prestige and recognition, meeting national development objectives and publishing in accredited journals. The emphasis of the Deans was on producing research for publication in accredited journals, solving development problems in their communities and encouraging more academics to do research. Researchers viewed publication in accredited journals, solving development problems, and meeting national development objectives as the main focus of their research and publishing objectives.

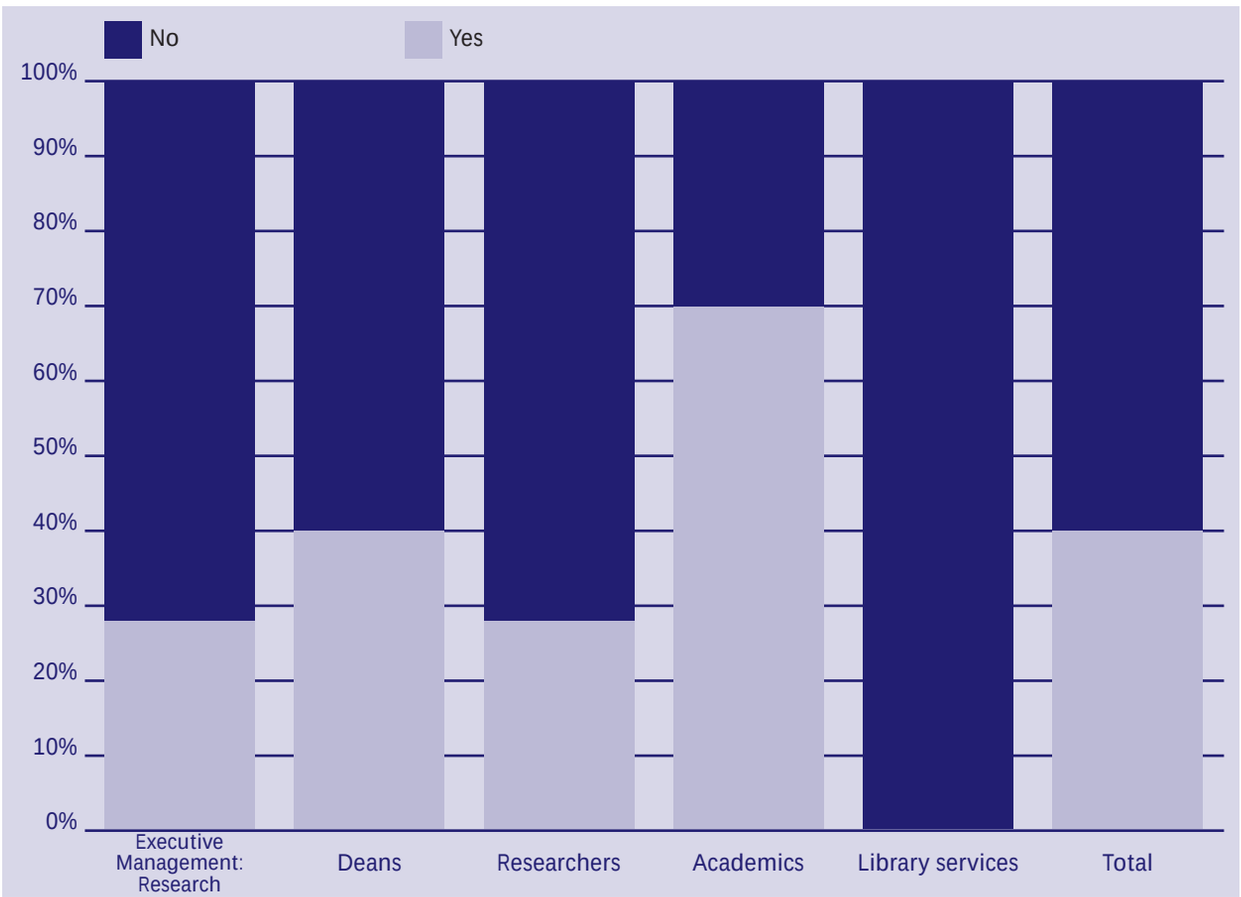
Since knowledge is an output of, and an input to, further knowledge production processes, the ability to access and disseminate it is vital for the knowledge production process. Thus, access to knowledge

constraints were investigated from two perspectives. Firstly, the study examined constraints to accessing knowledge in the universities in the study. Secondly, issues affecting dissemination were investigated.

The cumulative nature of knowledge requires prior knowledge in the knowledge production process. Unless knowledge is widely diffused across institutions and researchers, only a small share of its potential benefit for social and economic development may be realised. The relative ease or difficulty of gaining access to existing knowledge, according to Mokyr (2002), determines how quickly improvements in knowledge translate into rising human welfare. The existence of knowledge, however, does not guarantee that it will be accessed by everyone and exploited for further knowledge production processes.

Of the 76 executive managers, Deans, academics, senior researchers and respondents from library services, 54 percent outright stated that research output from the Southern African region is not accessible, while 46 percent indicated that they find it accessible.

Figure 2: Accessibility of Southern African research output

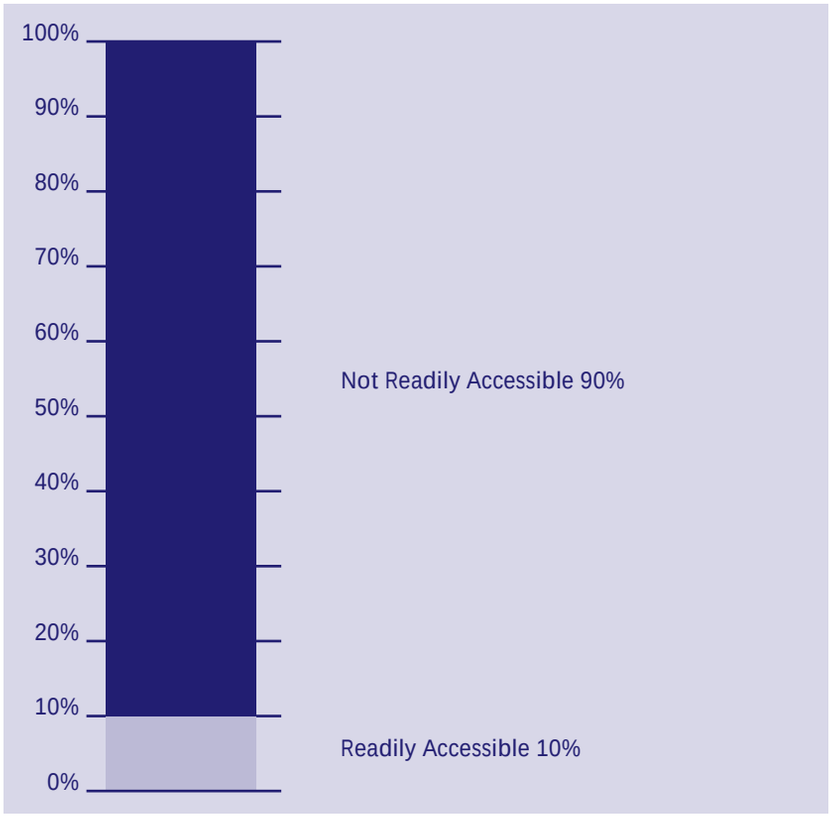


(N=76, excluding case study and press respondents)

All of the respondents from the library services category unanimously agreed that Southern African research is not accessible to institutions in the region, followed by executive managers responsible for research (66 percent), senior researchers (62 percent) and Deans (42 percent). Academics were more inclined to find research output accessible, with more than 80 percent indicating that they find Southern African research output accessible.

Of the 46 percent of respondents who agreed that research output is accessible, only 10 percent did so without qualification while the remaining 90 percent acknowledged that it is not readily accessible due to a number of constraints that are discussed below.

Figure 3: Readily accessible knowledge



(N=31)

8.2.1. Awareness of research and scientific output produced in Southern Africa

One of the primary constraints to accessing Southern African research and scientific output is an awareness of what has been produced. Many respondents observed that they are not aware of research output within their departments, faculties and institutions – never mind across institutions within the region. Several factors account for this situation, according to respondents.

Research and scientific output needs to be organised and made accessible. This involves some form of registration, often through deposits, in university libraries, and indexing in directories and databases. Since, according to respondents, much of the research that is produced is unpublished. It ends up on the shelves of the researchers and their sponsors. This is despite policies in some universities which require that all research output be deposited in the library. A deputy university Librarian observed:

> 'This local research is also not readily available and accessible to researchers within the institution itself. In the past, there was a policy where the university library was a depository of all publications by members of the university. It was a requirement that any member of staff who published an article will deposit a copy in the library and that copy will be kept in the Special Collection Division of the library. This practice has stopped. Very few researchers submit their publications to the library. More importantly, if those articles are deposited, they are supposed to be organised properly so that they can be easily accessible with good information retrieval tools. This has not been done and therefore it is not easily available.'

The predominance of unpublished research and scientific output in the form of seminar and conference papers, working papers, preprinted journal articles, theses, dissertations and research and technical reports (also referred to as 'grey' literature) does not lend itself to electronic discovery processes since it is often not indexed and made available online – and as a consequence is not accessible. The

use of mainstream discovery tools in the electronic environment such as online search engines, aggregation of content and indexing services, are of little use in this context. Respondents regard this situation as untenable and in many universities efforts are being made to publish these types of output online. This commitment appears to be at the highest level, as captured by a Deputy Vice-Chancellor: *'I am doing my best to have all the research available worldwide by publishing online all the research papers emanating from this university as well as workshops and presentations. If all Universities did this, life would be a lot easier'*. It appears that university leadership across the region appreciates the potential contribution this research-in-progress type of output can make to further research and development.

8.2.2. Making available research output

The behaviour of researchers when it comes to making their research output available appears to be a further major constraint to accessing research output. Respondents lamented the attitude of researchers who do not make their research available. A senior scientist within the natural sciences and engineering discipline indicated that this is not isolated behaviour, but rather: *'We have a culture where people don't feel comfortable sharing information even when something has been published. People want to keep information to themselves and that is not easy to get rid of, but it is a constraint'*. A Dean in the health and life sciences observed that this is a serious problem as some researchers actively hide their research. He stated: *'They tend to be selfish and try to hide it'*.

Fierce competition for limited research funding and opportunities for promotion appear to be the main motives behind the unwillingness of researchers to make available their research output. With regard to competition, a researcher in the natural sciences and engineering observed:

> 'There is a limited number of research grants in the university and what happens is that you apply for that grant, backed up by a good proposal. But, the university hasn't got enough of that money so it's a cake which we are sharing between so many. Some proposals are shut down, or you keep on refining or finding other research projects. You tend to hold on to your research and ideas in these circumstances.'

A DVC researcher stated that in some cases researchers guard their research *'for fear that their research might be stolen and used in applications for research grants'.* A Dean in the humanities and social sciences noted: *'Here we have become selfish and don't want to publish. Everyone wants to be a professor so it makes you become selfish'*.

8.2.3. Copyright

Two specific themes emerged on discussions on copyright as a constraint to accessing knowledge. These concerns were raised by all respondents in equal measure. From a teaching and learning perspective, respondents are aware of the need to seek permission from copyright holders – generally the publishers of textbooks and other research material (and in some cases the authors themselves, or the institutions such as government and universities), but the time required to do so and the knowledge and expertise involved in doing so serves as a barrier to getting permission. Commenting on this state of affairs, a Dean cautioned: *'You have to be careful. If you copy or take any material it will be illegal and you don't have the right to do that. That is a hindrance'*. Nevertheless, it was pointed out that in many instances, academics try and avoid copyright altogether in the interest of enabling their students to access the necessary information. Some innovative practices emerge, as a researcher in the humanities and social sciences acknowledge stated: *'The main problem is copyright where I cannot disseminate. If I have a paper to give to my students I have to think twice so I provide a different version of the paper through Powerpoint or they have to buy it. This is one way to disseminate'.*

From a research perspective, researchers appear to accept that when they publish copyright traditionally vests with the publisher and that they need permission to use this material in future. This does, however, not mean that they are satisfied with this state of affairs. Respondents are not

aware of, and do not understand the options available for retaining copyright. This often is a cause of frustration for university management, as one DVC Research explains when talking of the steps that are taken to educate researchers under the current circumstances:

> 'We are trying to educate researchers that if their articles are accepted, they still have the right to that information pre-final draft. If I send the editor the final copy, I can send it to the repository. That is the loop-hole. You can have a footnote saying where it will be published as you already have acceptance of it. Their ownership still exists prior to the final draft.'

A librarian who deals with copyright management, perhaps not surprisingly, is more forthright in her assessment of the impact of current copyright practices on access to research in the form of published output: *'Copyright holds academia by the scruff of the neck'*.

8.2.4. Capacity to make research output available online

Electronic forms of communicating and disseminating research could open up access to knowledge and research findings worldwide and present exciting opportunities for plugging African researchers into a flexible knowledge system (Sawyer 2004: 227). There is consensus among all respondents that the Internet provides the best and most effective method for communicating and disseminating research. Respondents acknowledge that it provides opportunities to speed up the dissemination process tremendously, but are concerned that it is not effectively happening within the university environment yet. As observed by a Dean in the humanities and social sciences:

> 'Upcoming academicians don't have avenues where they can disseminate information. The avenue does not have to be a genre, but even electronic copies through workshops so that it can be on websites. Such simple basic dissemination is not there. There is a gap. If we had better dissemination, not just journal papers, but also conference papers which can be given to people who do not attend the conferences. All of these can be put onto a website but they are not there.'

The main constraint, according to respondents, is the capacity to make the research available online in its various forms. In the first instance the human resources and the skills necessary to do so are not available. This is followed by concerns about funding and the technical infrastructure necessary to support online dissemination and publishing of research results. This is a concern at the highest levels within the university, as one DVC research acknowledged:

> 'One is the ability for us to put information on the university website. We have no capacity to do that – our office has no capacity. There is no college that I have heard of that has taken the initiative of saying let's collect all our reports and put them on our site so that people who access our sites will be able to see them. The major problem is the human and technical capacity of the institution to be able to put these on the site. We need to have one or two people to be tasked with collecting all the reports and then putting them in the format which can be accessed on the site.'

8.2.5. Publishing criteria for promotion and reward

The publishing requirements set out in the promotion and reward policies of the universities have a major influence on what researchers publish and where they seek to publish. The combination of the higher weighting given to publishing in peer-reviewed international journals appearing in the Institute for Scientific Information (ISI) indexes, the prestige associated with publishing in these journals and, in some cases, the payment of a subsidy to universities for staff publishing in these 'accredited' journals govern the publishing behaviour of researchers. Respondents expressed their dissatisfaction with the difficulties associated with publishing in these journals but acknowledged that they continued to try and do so because of the potential for career advancement and their professional prospects. Thus, respondents indicated that they would rather publish in these journals than in locally published journals. This in turn adversely impacts the availability and accessibility of

research output in the region that often ends up 'on the shelves' of researchers, rather than being disseminated widely through locally published journals.

8.2.6. *Journal publishing patterns*

Where research is published the journal format appears to be the most frequently used medium, followed by conference proceedings. In the case of journals first prize is to publish in rated international journals and then, perhaps, also in journals published in the region. This attitude towards publishing in journals appears to be universal across all disciplines. There are, however, several constraints associated with publishing in reputed international journals and the attitudes of researchers appear not to favour publishing in journals that are published in the region.

8.2.6.1. International journals

Motivated by possibilities for career advancement and the prestige associated with publishing in reputed international journals, researchers across the disciplines found it very difficult to publish in, or 'break into', such international journals. More than two-thirds of the researchers interviewed emphasised the difficulties associated with publishing in reputable international journals. A researcher in the science and engineering discipline explained the challenges associated with publishing in reputed international journals and shares some of the innovative tactics employed to get beyond the difficulties:

> 'To publish internationally is always a problem. Our papers are of a high quality but it is not always accepted. It helps if you do corroborative research with international known researchers, then it becomes easier to get your papers published. The other problem is the time it sometimes takes to have your research published in international journals. It can easily take up to two years before it is accepted.'

Respondents had different perceptions about why this may be the case. One theme is that the nature and focus of the research in the region is different to what is required by international journals published in the north. A senior researcher in the health and life sciences discipline explains: '*The whole process of having it published is a constraint. The kind of studies conducted elsewhere compared to the studies conducted in our region, are different. Our studies are exploratory and qualitative in nature'.* Respondents explained that their research has a much greater problem-solving focus and does not necessarily lead to scientific publication.

Another major theme was a perceived bias against African research and researchers by the international scientific community and the international journals they seek to publish in. This perception was conveyed in no uncertain terms. A Deputy Vice-Chancellor questioned whether *'research from the region is treated with the same respect as research from the rest of the world'.* A Dean in the humanities and social sciences had a fundamental problem with the way in which the term 'international' in 'international journal' is defined and suggested that: '*We must define what we mean by 'international' because in most cases it means 'Western'. The definition of international journals must be defined as it currently does not include African journals'*. This bias is not only a problem of northern bias against African research, but also one of African researchers against African research. The following statement by a researcher in the health and life sciences represents this bias:

> 'Yes, but it must be accredited and validated. You need something that is internationally validated and this is a problem with local non-accredited publications. How valid is the research? Our emphasis is more on internationally accredited publications. We have to internationally validate ourselves.'

The predilection for publishing in reputable international journals has an unintended consequence for the accessibility of Southern African research output to researchers within universities in the region when research output is accepted for publication in the reputable international journals. The most important of these, according to DVC's, researchers and librarians, is the increase in the cost of

journal subscriptions and the impact this has had on the subscriptions of university libraries. One DVC noted that *'journals are very expensive and African economies cannot afford the expenses'*. A librarian explained the practical consequences in the following terms:

> 'A major constraint is funding and in terms of acquiring additional information resources, we have reached the stage where if we are approached by an academic department to purchase a new journal, another journal must be cancelled. Shrinkage is required. The exchange rate is also working against us as the bulk of information we purchase is from America.'

The practice by publishers of offering libraries journals as 'Big Deal' packages, where titles are purchased in a bundle without much room for choice over which titles are included in the package, further contributes to limiting the libraries' ability to respond to the demand of faculty members. A DVC Research lamented this practice saying: *'Publishers require libraries to subscribe to 'packages' of journals which may include journal titles that we do not need. This has the consequences of making it difficult for libraries to make subscription decisions'.*

8.2.6.2. Journals published in the region

One would have expected the attitude of respondents to be favourably predisposed to publishing in journals published in the Southern African region, given the reservation in respect of international journals expressed above. Yet, the attitude towards publishing in these journals appears not to be favourable either – as captured by the statement made by a respondents in the health and life sciences: *'Our researchers prefer to publish in other journals as the Malawian Medical Journal is a small local journal and people think it is of a lesser standard in terms of acceptance to the wider community'.*

The limited knowledge of what is published in the region, coupled with the bias against publishing locally, was expressed in the following terms by a researcher in the science and engineering discipline:

> 'Yes, I think the reason is that the idea for Africans coming together has not been there. It is new. In the past it was just ideal for someone to publish his work in the UK or USA. I wouldn't know who has published where in Africa.'

Respondents raised several concerns. The promotion and reward incentives favour publishing in international journals over local journals and has spawned the perception that international journals are more credible and prestigious than ones published in the region. This, according to respondents, creates a downward spiral as they tend to publish their best work in international journals rather than local journals so that this lack of support further impoverishes the already weakened credibility and prestige of local publications.

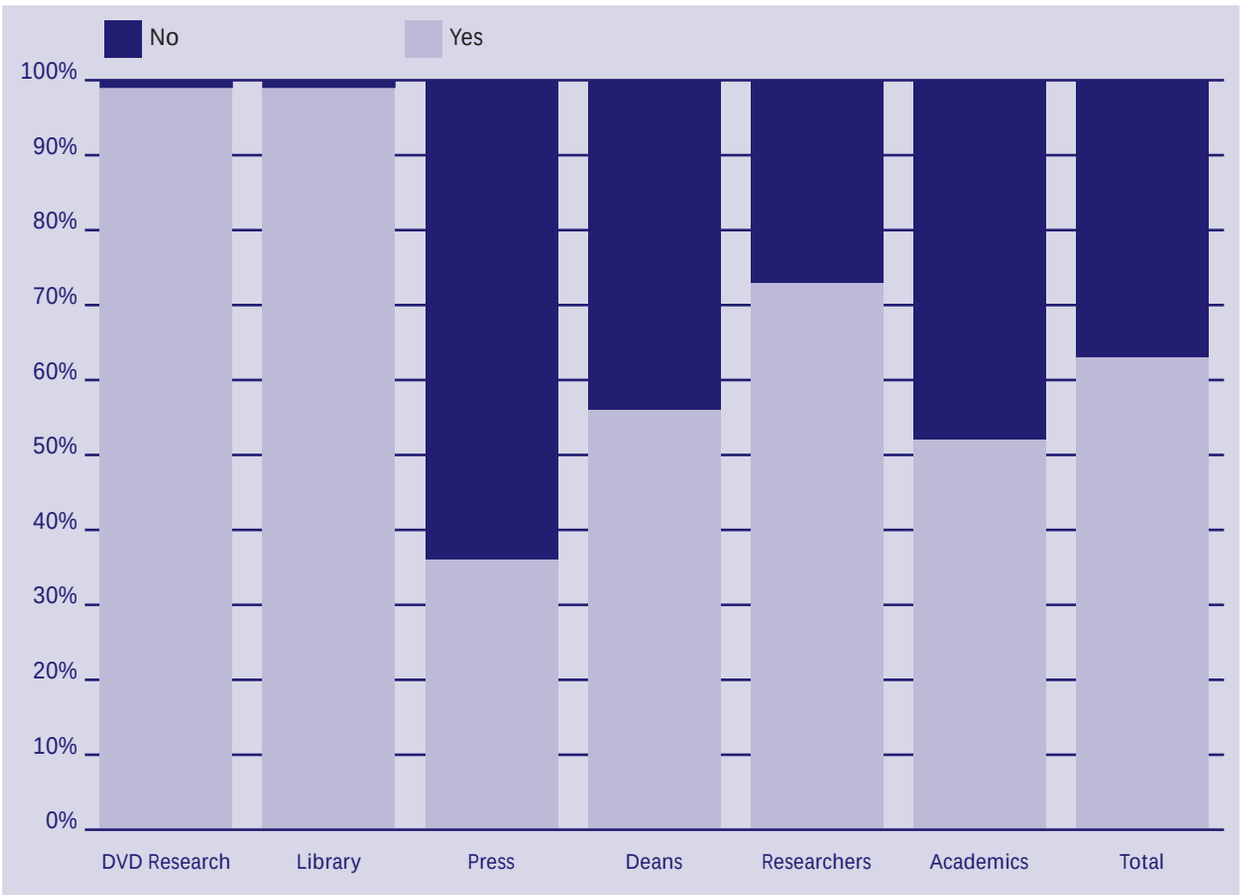
Where respondents do opt to publish locally the uncertainty associated with the continued existence of many journals, or the cases where journals are not published on a regular basis, do not bode well for the confidence and trust of researchers. Several examples were cited where journals are not published regularly or ceased to exist altogether. Perceptions of poor quality and standards, given the limited number of experiences and senior researchers to perform peer review functions, and specialist skills required to undertake editorial activities were also cited as issues of concern. Representatives from the university presses highlighted the issue of funding as the biggest constraint, followed by the lack of human resources.

Gaining access to journals published in the region was further raised as a major constraint. Many respondents, once they have 'stumbled on' a reference or citation, find it difficult to access the required article in the specific journal. For most the library is the first port of call but often they have to resort to personal networks to access the publication. This, according to respondents, takes up valuable time and in many cases they are required to spend their own funds on obtaining the publication.

8.3. Perceptions on, and constraints to Open Access

Respondents were asked if they are aware of Open Access approaches to knowledge production and dissemination and if it would benefit their institutions and what challenges they associated with the implementation of Open Access. A significant 71 percent of respondents are aware of Open Access approaches to disseminating knowledge. All the DVC's for research and librarians are aware of Open Access indicating that progress is being made at creating awareness of Open Access at institutional level. Eighty percent of researchers and more than 60 percent of Deans are aware of Open Access. It was only among respondents representing the university press that awareness of Open Access was less than 50 percent.

Figure 4: Awareness of Open Access



(N=83, excluding case study interviews)

Seventy-seven percent of respondents (N=59), who are aware of Open Access explicitly stated their support for the introduction of Open Access approaches to promote access to knowledge. Two-thirds of the DVC's for research interviewed were explicitly in favour of Open Access. As one noted:

> 'Firstly, it's an extremely good idea. It will bring information, that is not readily available, to our fingertips. Outside work in other countries will be brought to our fingertips. We will also be able to review the conditions and outreach on the type of work done, the results achieved and decide if we were to replicate those ideas and what modifications will be necessary for us to do. So, in my view, I think the whole concept is very, very welcome and is a very good idea.'

From discussions it emerged that decision-makers are grappling with the implications of Open Access and understand its strengths and limitations, as observed by another DVC research: *'Open Access does more as a tool for dissemination than it is a tool for growing and in that lies its strength. It makes research findings*

accessible to more people and the university is at the stage where we try to convince researchers that it is in their best interest to make their research available to all'.

The benefit most strongly associated with Open Access approaches cited by respondents who are in support of Open Access is that it will make research widely available and support further research. In explaining the benefit of Open Access, a librarian explained:

> 'There would be a huge benefit to such an approach as it would enrich the research that the university does. You could become aware of work done elsewhere but in your discipline. If you are not aware of work being done elsewhere, there is a problem of repetition. Research relies on work that was done before and the quality of what you do relies on the quality of the previous research.'

Notwithstanding the support for the introduction of Open Access to promote access to knowledge, respondents did raise a number of concerns pertaining to the quality of Open Access material that is not peer-reviewed; copyright, plagiarism and recognition for research output.

8.3.1. Quality and peer review

Respondents expressed concern about the quality of Open Access material, particularly when it is not peer-reviewed. Peer review has long been regarded as an important measure of quality control among scholars in spite of the difficulties that have surfaced with regard to the process – such as the time it takes and reviewer subjectivity. In discussion peer review emerged as a proxy for quality. The assurance by the peer review process is, for many respondents, non-negotiable to the extent that it determines their willingness to support Open Access. According to respondents, peer review assists them in sifting and evaluating what resources are credible. A Dean in health and life sciences remarked:

> 'It should be Open but with responsibility and therein lies the problem in that you could get a lot of information that is inaccurate. The fear in the academic world is in how you distinguish between valid, useful information and that which is not valid. We still strongly believe in the peer review process.'

8.3.2. Intellectual property rights

Respondents are plagued by uncertainties pertaining to intellectual property rights in the electronic environment. It emerged from discussions that respondents are not clear about where ownership vests in the context of Institutional Repositories in particular and which rules apply to govern ownership in this case. According to most librarians interviewed intellectual property policies are in place or under preparation within their institutions but the extent to which this in practice provides guidance is not clear – more so with regard to the electronic environment. A Dean in humanities and social sciences summed it up as follows:

> 'This would create problems in terms of Intellectual Property of the research. We had a project where we published an on-line study guide and some of the problems that we encountered were that students would print these materials and sell it. The problem came in the question of 'who owns this material?'

8.3.3. Fear of plagiarism

Another key concern that negatively influences the attitude of respondents toward Open Access is the fear of plagiarism. They are of the view that you have no control over what happens to the research once it is published on the Internet and that anyone can plagiarise it. An academic in the humanities and social sciences said: *'It generates the tendency to imitate and plagiarism happens'.* A librarian, however, observed that this fear is unfounded since it is easier to discover plagiarism in the electronic environment with the tools and software available for detecting plagiarism.

8.3.4. *Recognition of Open Access research output*

Publication of research output plays an important role in the academic reward system. Respondents confirmed that promotion and reward is contingent on publishing in outlets that favour international journals with the highest impact factors being when published in the north. A DVC research reflects: *'We are generally better at producing regulations for dissemination than we are at producing regulations for access. We have regulations telling people where, how and even what to publish but the conditions, as it stands, constrains access'.*

Existing promotion policies are the kind of regulations that reproduce and sustain these publishing practices among academics. A Dean in the science and engineering discipline suggests:

> 'There is need for a paradigm shift in the perceptions and thinking of the promotions committees regarding e-journals, that they are peer-reviewed and that eventually it is possible hard copies may be eventually phased out. Some people believe that an e-journal should carry less weight as opposed to a hard copy journal when it comes to rating them.'

Uncertainty over whether Open Access channels will be afforded the same recognition in university promotion policies has the effect of creating a 'wait-and-see' attitude among respondents.

8.3.5. *Operationalising Open Access*

Some respondents found it difficult to conceive how universities could go about 'operationalising' Open Access, given the constraints in university policy, capacity and funding. According to respondents how and where to start introducing and operationalising Open Access, and who, within the institutions, should be the drivers thereof are some of the key questions that need to be addressed before universities proceed with introducing Open Access.

8.4. Measures for encouraging new approaches to knowledge production and dissemination

It emerged in discussions with respondents that the primary focus of universities at present is on increasing output, rather than introducing measures to encourage new approaches to knowledge production and dissemination. Measures to grow research output include the development of policy, capacity building, incentives and funding. Policy measures include the introduction of research policies that set out the research priorities for the university and at the same time develop core areas of research expertise, or Centres of Excellence. Universities are also in the process of, or have recently completed, a review of their promotion policies which emphasise the importance of research output and publication as key criteria for promotion. A range of measures have been introduced to build capacity to generate higher levels of research productivity. These include mentorship programmes for young researchers; workshops on basic research and writing skills. In many cases universities have introduced awards and other means of recognising researchers as incentives to encourage researchers. In some case, the incentives include awarding funding to researchers.

In addition to the conventional measures formulated and implemented by universities to encourage knowledge production and dissemination, a number of innovations have been introduced to increase the accessibility and visibility of research output as a means to stimulate further research and increase the effectiveness of teaching and learning. Six case studies were identified and analysed as examples of the kinds of initiatives that are currently underway to determine the types of initiatives, their aims and objectives, the challenges faced and factors critical to the success of these projects. The main criteria for the selection of the cases was that scholarly material should be made available online, free of charge to the user.

8.4.1. *Types of Initiatives*

It is evident from the case studies that different types of initiatives are being experimented with. These range from developing an electronic catalogue of university scholarly materials that will be

networked as the basis for developing an institutional repository to the establishment of a repository of electronic theses and dissertations (ETD's); the implementation of an institutional repository for all scholarly output including images from cultural collections and to the production of an electronic journal. In one case, the introduction of Library 2 services and products are being introduced to enhance the experience of library users and involve blogging and wikis. An initiative in support of distance learning involves the development of online, web-based education and tele-learning. The projects typically involved the capture, storage, indexing, preservation and dissemination of intellectual output in digital format.

8.4.2. *Motivation and objectives*

All the initiatives have, as a primary outcome, an envisaged increase in access to research and learning material produced by a university. Several secondary objectives are pursued through the implementation of the projects and include:

- increasing the visibility of faculty and research output;
- establishing a central point for accessing research output within the university; and
- enhancing the delivery of services to the user community.

8.4.3. *Challenges*

Respondents identified issues pertaining to university policy environments, institutional capacities, technical capacities and funding as the key factors adversely impacting initiatives.

8.4.3.1. University policy environment

The case studies revealed that university policies can have a major impact on the extent to which faculties and broader university communities are willing to participate in initiatives that promote increasing access to research output through Open Access. For example, the increase in the submission of ETD's in one case study was, according to the respondent, driven by a decision that mandates all students registered for a Masters or a doctorate to submit their research in electronic format to the repository before graduation. Also, faculties remain hesitant to fully commit to publishing in electronic journals or making their research available in institutional repositories for as long as promotion policies do not recognise research output in additional channels of dissemination in the electronic environment. This is particularly the case where funding is linked to the publication of research output in accredited journals.

8.4.3.2. Institutional capacity

Institutional capacity was identified in all the case studies as a major challenge. It refers to available human resources and skills, management capability and the capacity to work in teams and partnerships. In all but one of the case studies the library was one of the key drivers in the establishment of the initiative. Often, this is not by choice, but rather by default. The projects tend to place additional responsibilities on project participants, over and above their normal workload. This, in environments in which human resources are already overburdened, puts enormous pressure on implementers. Moreover, the skills necessary to implement these kinds of initiatives need to be developed while implementing the projects since the resources are not available to source the necessary skills from outside the institution. Furthermore, partnerships in which project implementers are required to work in teams across different professional and technical specialisations add to the complexities and difficulties experienced in these projects. For example, in nearly all cases information specialists from library environments need to work with information technology specialists from the IT departments, whose focus typically is on ensuring that the technology infrastructure and network remain operational – a focus on risk management, rather than innovation. Conflicts arising from these different cultures require time and energy to resolve.

8.4.3.3. Technical capacity

Making research output accessible in an electronic networked environment requires technical capacities that may not be readily available within the university (at least not in one function within

the university). These include the hardware, software and networking technology requirements for building digital repositories or publishing electronic journals. Knowledge and skills are necessary to evaluate the digitalisation and handling requirements of the institution against the specifications of the hardware and software available for acquisition purposes. Expertise in organising, managing and presenting digital collections is another requirement, over and above the technical project management expertise necessary to successfully implement projects of this nature. Experimentation and learning is, therefore, a big part of the projects reviewed.

8.4.3.4. Funding

Funding, or rather the lack thereof, is a constant threat which project implementers need deal with. In some cases universities are able to provide part funding and the rest needs to be generated from donors and other funders. In other cases, projects are completely dependent on donor funding.

8.4.4. Critical success factors

Respondents identified the factors below as critical to the successful implementation of projects:

8.4.4.1. Strategic frameworks

The importance of acting strategically and being guided by the priorities of a university is critical, according to respondents. It is important to demonstrate how projects will contribute to the university achieving its strategic objectives. Respondents reflect that *ad-hoc* projects that do not form an interdependent set of activities which gradually builds towards a strategic objective, compromise the sustainability of initiatives.

8.4.4.2. Partnerships

Respondents acknowledged that despite the difficulties which are encountered in partnerships, projects have no chance of succeeding without them. Partnerships are especially important for generating necessary resources along with buy-in through stakeholder participation.

8.4.4.3. Capacity building

Identifying the future capacity building requirements to sustain projects is an important element in the success of the projects reviewed. Often this involves identifying organisations that could become strategic partners in a project and at the same time, provide staff development in the form of training and other technical assistance measures.

9. Conclusions

Southern Africa is falling behind, relative to global scientific output. The need to make knowledge produced in Southern Africa widely available and accessible in order to encourage further research, is acknowledged as one of several measures needed to increase research productivity in the region. Respondents interviewed were unequivocal that the research and publishing objectives of their universities, faculties and departments are not met at present. A major contributing factor is the accessibility of Southern African research output, given the cumulative nature of knowledge, as both an input and an output of the knowledge production process. More than half of the respondents find that Southern African research is not accessible. Those who find it accessible, acknowledge that it is not readily so.

A fundamental constraint to making research accessible is that respondents are not aware of what research is produced and available in the region. Many researchers do not share their research output. The capacity to make research output available online is not available and perceived restrictive copyright practices influences what research output researchers believe they are entitled to make available. Publishing criteria that govern the publishing behaviour of researchers ensure that they publish in journals which may not be affordable and accessible to university libraries in the region. A wider range of research needs to be acknowledged and rewarded if Southern African research is to be truly accessible.

Awareness of, and support for, Open Access appears to be gaining ground. Earlier studies in South Africa found that there was little awareness of Open Access and that there is little chance of Open Access publishing being taken up widely by academics without a sustained advocacy programme (de Beer, 2005; Moller, 2006). Seventy-one percent of respondents reported that they are aware of Open Access, of which 77 percent stated their explicit support for introducing Open Access approaches to promoting access to knowledge.

A number of concerns in respect of the operationalisation of Open Access needs to be addressed. These include the recognition of research output published in Open Access formats and channels, perceptions of poorer quality associated with Open Access published material, the fear of breaching intellectual property rights and the fear of their research being plagiarised. This should involve introducing measures to create favourable university policy environments with specific references as to how policies on promotion and reward recognise Open Access published output. Moreover, institutional and technical capacities need to be developed to empower universities to publish their research output in the electronic environment. Without the necessary funding to develop these capacities and disseminate knowledge produced in Southern Africa, universities using Open Access approaches the potential for making research, produced in the region by universities, widely accessible may not be realised.

BIBLIOGRAPHY

Abrahams, L., (2005) *South African Higher Education in the 'Knowledge Economy': Visions and Vignettes towards the Future*, available: http://www.triplehelix5.com/pdf/A309_THC5.pdf [accessed 20 January 2008].

Academy of Science of South Africa (2006) *Report on a Strategic Approach to Research Publishing in South Africa*, available: http://www.assaf.co.za/strat_report.html [accessed 02 December 2007].

Assie- Lumumba, T., (2005) 'Critical Perspectives on African Higher Education', JHEA/RESA Vol. 3, No. 3, 2005, pp. 1-29, available: http://www.codesria.org/Links/Publications/jhea3_05/assie_lumumba.pdf [accessed 20 January 2008].

Benkler, Y., (2006) *The Wealth of Networks*, Yale University Press: Yale and New York also available: http://www.benkler.org/Benkler_Wealth_Of_Networks.pdf [accessed 18 March 2008].

Bernheim, C.T & de Souza Chaui, M., (2003) *Challenges of the university in the knowledge society, five years after the World Conference on Higher Education*, UNESCO Forum Occasional Paper Series No. 4, available: http://portal.unesco.org/education/en/file_download.php/697c33597621cdab0b77507d31da8cf8Tunnerman+(English).pdf [accessed 17 March 2008].

Castells, M., (1998) *The Information Age: Economy, Society and Culture. Volume III. End of the Millennium*, Blackwell: Oxford.

Chachage, S. L., (2006) 'The University as a Site of Knowledge: The Role of Basic Research', JHEA/RESA Vol. 4, No. 2, 2006, pp. 47-67, available: http://www.codesria.org/Links/Publications/jhea2_06/chachage.pdf [accessed 04 January 2008].

Chan, L., & Costa, S., (2005) 'Participation in the Global Knowledge Commons: Challenges and opportunities for research dissemination in developing countries'. *New Library World* 106 (1210/1211) 141 - 163.

Chen, D., & Dahlma, C., (2006) *The Knowledge Economy, The KAM Methodology And World Bank Operations*, World Bank Institute, available: http://siteresources.worldbank.org/WBI/Resources/The_Knowledge_Economy-FINAL.pdf [accessed 15 January 2008].

De Beer, J., (2005) *Open Access scholarly communication in South Africa: current status, significance, and the role for National Information Policy in the National System of Innovation*, unpublished thesis, University of Stellenbosch.

Gibbons, M., (2000) 'Universities and the New Production of Knowledge: Some Policy Implications for Government', in Kraak, A., ed., *Changing Modes: New knowledge production and its implications for higher education in South Africa*, HSRC Press: Cape Town.

Gray, E., (2006) 'At the South Eastern Frontier: The Impact of Higher Education Policy on African Research Publication'. Paper delivered at the *CODESRIA-ASC Conference on Electronic Publishing and Dissemination* September 6-8, 2006, Leiden, The Netherlands, available: www.policy.hu/gray/docs/ASC_Codesria_conference_paper.doc [accessed 04 February 2008].

David, P.A., & Foray, D., (2002) An introduction to the economy of the knowledge society. *International Social Science Journal*, 54(171), 9.

Duderstadt, J. J., Atkins, D. E. and Van Houweling, D., (2002). *Higher Education in the Digital Age: Technology Issues and Strategies for American Colleges and Universities*, American Council on Education and Praeger Publishers, Westport, CT.

Etzkowitz, H., (1998). The Triple-Helix of Academia-Industry-Government: The U.S. National Innovation System. In R. Anderson, T. Cohn, C. Day, M. Howlett & C. Murray (eds.), *Innovation Systems in a Global Context* (pp.127-147). Quebec: McGill-Queen's University Press.

Favish, J., 2006. *Portraits Practice-Social Responsiveness in Teaching and Research at UCT 2005*, University of Cape Town, UCT Social Responsiveness Information Hub, available at: http://www.uctsocialresponsiveness.org.za/File_Uploads/File/Reports/Portraits%20Practice-

Social%20Responsiveness%20in%20Teaching%20and%20Research%20at%20UCT%202005.pdf [Accessed October 9, 2008].

Floridi, (1999) *Philosophy and Computing: An Introduction*, Routledge: London.

Guedon, J-C., (2001) Beyond Core Journals and Licences: The paths to reform scientific publishing. ARL Bimonthly Report 218. October 2001.

Haukka, S., (2005) *Research training and national innovation systems in Australia, Finland and the United States*, unpublished thesis (Phd.) RMIT University, Melbourne, Australia, available: http://www.intcap.com/downloads/ICS_Article_2005_National%20Innovation%20Systems%20-%20Finland,%20Sweden%20and%20Australia%20Compared.pdf [accessed 19 March 2008].

Houghton, J. W., (2003) *Changing Research Practices in the Digital Information and Communication Environment*, Department of Education, Science and Training, Australian Government, available: http://www.dest.gov.au/NR/rdonlyres/AC17B809-3896-46E2-920A-0FD5CA29F843/1424/c_res_pract.pdf [accessed 20 January 2008].

Houghton, J., Steele, C., and Sheehan, P., (2006) *Research Communication Costs in Australia: Emerging opportunities and benefits*. Melbourne: Government of Australia, Department of Education, Science and Training, available: http://www.dest.gov.au/NR/rdonlyres/0ACB271F-EA7D-4FAF-B3F7-0381F441B175/13935/DEST_Research_Communications_Cost_Report_Sept2006.pdf [accessed 19 September 2008].

Houghton, J., Steele, C., & Downes, S., 2006. *Research Communication Costs in Australia: Emerging Costs and benefits*, DEST. Available at: http://www.downes.ca/cgi-bin/page.cgi?author=4310 [accessed October 5, 2008].

International Council for Science (2005) *Harnessing Science, Technology, and Innovation for Sustainable Development*. A report from the ICSU-ISTS-TWAS Consortium ad hoc Advisory Group, available: http://www.icsu.org/Gestion/img/ICSU_DOC_DOWNLOpen AccessD/584_DD_FILE_Consortium_Report.pdf [accessed 04 February 2008].

Kanyengo, C. W., (2006) 'Managing Digital Information Resources in Africa: preserving the integrity of scholarship', Paper delivered at the *CODESRIA-ASC Conference on Electronic Publishing and Dissemination* September 6-8, 2006, Leiden, The Netherlands, available: www.ascleiden.nl/Pdf/elecpublconfkanyengo.pdf [accessed 05 December 2007].

Kerloff, K., (2006) *Access to Knowledge in a Network Society: A Cultural Science Perspective on the Discussion on a Development Agenda for the World Intellectual Property Organisation*, unpublished thesis (M.A.) Universität Lüneburg, available: http://nearlyfreespeech.org/downloads/a2k.netsoc.pdf [accessed 20 January 2008].

Lieberwitz, R, L., (2006) 'Expanding Global Access to Knowledge: The Role of the University', Paper presented to the *Knowledge, Economy and Management Congress*, Kocaeli, Turkey, November 3 - 6, 2006.

Lor, P.J., and Britz, J,J., (2004) 'Information imperialism: Moral problems in information flows from South to North'. In Mendoza T and Britz JJ (eds) *Information ethics in the electronic age: Current issues in Africa and the world*. Jefferson NC: McFarland.

Meek, V, L., (2003) *Market Coordination, Research Management and the Future of Higher Education in the Post-Industrial Era*, UNESCO Forum Occasional Paper Series No 5, available: http://unesdoc.unesco.org/images/0013/001341/134121e.pdf [accessed 17 January 2008].

Mokyr, J., (2002) *The Gifts of Athena*. Princeton, NJ: Princeton University Press.

Moller, A., (2006), *The Case for Open Access Publishing, with Special Reference to Open Access Journals and their Prospects in South Africa*, unpublished thesis (M.A.) University of the Western Cape.

Nentwich, M., (2003) *Cyberscience: Research in the Information Age*, Austrian Academy of Science Press: Venna.

Ondar-Okemwa, E., (2007) 'Scholarly publishing in sub-Saharan Africa in the twenty-first century: challenges and opportunities', Paper presented at the *PKP Scholarly Publishing Conference*, available: http://pkp.sfu.ca/files/Scholarly_publishing_in_sub.pdf [accessed 04 December 2007].

Organisation for Economic Cooperation and Development (1996) *Knowledge Based Economy*, available: http://www.oecd.org/dataoecd/51/8/1913021.pdf [accessed 09 February 2008].

Pfeffer, T., (2003) *Virtualisation of Research Universities: Raising the Right Questions to Address Key Functions of the Institutions, Centre for Studies in Higher Education*, University of California, Berkeley available: http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1015&context=cshe [accessed 22 March 2008].

Phillips, KPA., (2006) *Knowledge Transfer and Australian Universities and Publicly Funded Research Agencies*, A Report to the Department of Education, Science and Training, Australian Government, available: www.dest.gov.au/.../36818C20-9918-4729-A150-464B662644B3/12630/Knowtran_FinalCompilation_005_web1.pdf [accessed 20 January 2008].

SARUA, (2006) *Strategic Implementation Plan 2007 - 2012*, available: http://www.sarua.org/files/publications/SARUAStrategicImplementationPlan.pdf [accessed 14 September 2008].

SARUA, (2008) *ICT: A Status Review of ICT in Universities in the SADC Region*, Study Series 2007, Compiled by Alex Twinomugisha, available: http://www.sarua.org/files/publications/ICT%20Strategy_Full.pdf [accessed 14 September 2008].

SARUA, (2008a) Science and Technology: A Baseline study on Science and Technology and Higher Education in the SADC Region, Study Series 2007, Compiled by Johan Mouton and Team, available: http://www.sarua.org/files/publications/ST_Full_Report.pdf [accessed 14 September 2008].

Sawyerr, A., (2004) 'African Universities and the Challenge of Research Capacity Development', JHEA/RESA Vol. 2, No. 1, 2004, pp. 213-242, available: http://www.codesria.org/Links/Publications/jhea1_04/sawyerr.pdf accessed [20 January 2008].

Schiltz, M., Vershraegen, G., Magnolo, S., (2005) 'Open Access to Knowledge in World Society?' *Soziale Systeme 11*(2005), Heft 2, S. 346 - 396, available: http://www.soziale-systeme.ch/pdf/Schiltzetal.pdf [accessed 25 March 2008].

Suber, P., (2003) Removing the Barriers to Research: An Introduction to Open Access for Librarians. *College & Research Libraries News*, 64, February, 92-94, 113, available: http://www.earlham.edu/~peters/writing/acrl.htm [accessed 19 September 2008].

Sun Tzu, (1988) *The Art of War*, Translated by Thomas Cleary, Shambala, Boston & London.

Swan, A., (2005) Open Access. JISC Briefing Paper. London: Joint Information Systems Committee.

Swartz, D, (2006) 'New pathways to sustainability: African universities in a globalising world', in Nkomo, M., Swartz, D. & Maja, B. (eds), *Within the realm of possibility: from disadvantage to development at the University of Fort Hare and the University of the North*, HSRC Press, Cape Town.

UNESCO, (2005) *Towards Knowledge Societies*, available: http://unesdoc.unesco.org/images/0014/001418/141843e.pdf [accessed 04 February 2008].

United Nations Development Programme (2001) *Human Development Report 2001: Making New Technologies Work for Human Development*, available: http://hrd.undp.org/en/media/completenew1.pdf [accessed 04 February 2008].

UN Millennium Project (2005) *Innovation: Applying Knowledge in Development.* Task Force on Science, Technology, and Innovation, available: www.unmillenniumproject.org/documents/Science-complete.pdf [accessed 03 December 2007].

Willinsky, J., (2006) *The Access Principle: The case for Open Access to research and scholarship*. Cambridge, MA: MIT Press.

World Bank (1999) *World Development Report 1998/99: Knowledge for Development*, available: http://www.worldbank.org/wdr/wdr98/contents.htm [accessed 04 February 2008].

World Bank (2002) *Constructing Knowledge Societies: New Challenges for Tertiary Education*, available: http://siteresources.worldbank.org/EXTAFRREGTOPTEIA/Resources/Constructing_Knowledge_Societies.pdf [accessed 20 January 2008].

Opening Access to Knowledge in Southern African Universities

Study Series 2008